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ABSTRACT

Abstracts of 155 original research papers presented at the 1979 American Alliance for Health, Physical Education, Recreation, and Dance convention are given. Papers are grouped by topic for each session of the convention. Time and date for each presentation of the papers is indicated and the name and address of the author to whom inquiries for further information may be sent are given. The volume contains an index of all included authors. (LH)

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# ABSTRACTS

## Research Papers 1979 AAHPER Convention

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# ABSTRACTS

## of Research Papers 1979

Presented at the New Orleans, Louisiana Convention of the
American Alliance for Health,
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in the Research Consortium Meetings

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# PREFACE

This volume of Abstracts of Research Papers 1979 includes abstracts, precisely as submitted by authors of 155 original research papers scheduled for presentation at the New Orleans, Louisiana Convention of the American Alliance for Health, Physical Education, and Recreation, March 16-20, 1979. The papers were grouped by topic for each session, as noted in the table of contents.

The time and date for the presentation of each original research paper are indicated in the lower left-hand corner. In all cases, the name and address of the author to whom inquiries for further information may be sent appear in the lower right-hand corner. An index of all authors is presented at the conclusion of this volume.

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LEG DYNAMICS OF MAXIMUM SPEED SPRINTING. Brant Tolsma, Indiana University.

The purpose of this study was to identify the variations in leg mechanics of twenty-five sprint-trained track and field athletes and to determine which variables were most important to high maximum speed sprinting ability. Athletes from the Indiana University track team and the Indiana Track Club were filmed at the 60 yard mark of a 70 yard dash as they sprinted across a four foot square force platform. The films were digitized and computer programs were written to determine the linear velocities and accelerations of the leg joints and the angles, angular velocities and angular accelerations of the three leg segments through an entire stride cycle of the right leg. Ground contact force recordings were used in conjunction with the accelerations computed from the films and Dempster's body mass data to compute the variations of torques about the hip, knee, and ankle joints during the same stride cycle. The large quantity of resulting information identified individual strengths and weaknesses. Several athletes compensated for deficiencies in one variable with exceptional ability in another. The method of the investigation proved to be an excellent method for identifying specific training needs of individual sprinters.

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March 16, 1979
9:00 am

7

RUNNING PATTERN OF HIGHLY SKILLED DISTANCE RUNNERS. Michael J. Dunetts, University of Illinois at Urbana-Champaign; Charles J. Dillman, University of Illinois at Urbana-Champaign.

The purpose of the study was to obtain information about the running patterns of forty-eight highly skilled track athletes, and then present this information to the athletes and their coaches for their future use. The study was carried out at the University of Illinois and involved the filming of athletes from 800m, 1500m, 3000m steeplechase, 5000m and 10000m events. Each athlete was run over a 300m course and filmed from the side and front during the latter part of the run. The films were developed and analyzed the day following the filming and then presented to the athletes and coaches. A quantitative analysis of the running involved the following parameters; thrust angle, touchdown of the foot relative to the center of gravity, trunk angle at midstance, vertical rise of the center of gravity during a running stride, stride length, stride rate, time of support, time of non-support, horizontal velocity, ratio of stride length to leg length. Norms were computed for each of three running velocity ranges: 5.5-6.5 m/s, 6.5-7.5 m/s, 7.5-8.5 m/s. By comparing individual values of each parameter with the norm for a particular running velocity, a picture of the athlete's running style could be obtained. Parameter values lying more than one standard deviation from the norm could indicate a deficiency in the running style. Due to the fact that individual differences in running styles do exist however, these norms can only serve as guidelines; they are not intended to be absolutes.

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March 16, 1979
9:15 am

## MECHANICAL ANALYSIS OF SELECTED FACTORS INVOLVED IN THE TAKE-OFF PHASE OF THE LONG JUMP.

Sarah L. Smith, Indiana University; Betty H. Haven, Indiana University.

The intent of this investigation was to describe and compare selected mechanical variables associated with the performance of highly skilled male long jumpers. A secondary purpose was to determine the feasibility of conducting cinematographic research within the limitations of an actual competitive situation. This research was conducted at the request of and funded by the U.S. Track and Field Committee of the U.S. Olympic Development Committee. Cine analyses were completed on the 28 legally executed jumps of 8 athletes filmed during competition at the 1978 Summer Sports Festival at Colorado Springs. Jump lengths ranged from 26'7.75" to 21'7.25". Each jump was filmed at 150 fps with a LOCAM camera using 16mm B&W film (Kodak 2498). Specific variables selected for the analyses included the lengths of the last two approach steps; horizontal velocities of body COG during these steps and during board contact; and horizontal, vertical, and linear velocities at take-off. The angle of braking force at contact, distance of take-off toe behind the board, time of board contact, height of body COG at take-off, and angle of projection of body COG were also determined. Measures were obtained of the trunk, hip, and knee angles at take-off. Mean values were calculated for each variable. To discern the important factors exhibited in a successful jump vs. a less successful jump, the seven longest and seven shortest jumps were compared. The range of the jumps within the "long" and "short" groups were 25'5.75" to 26'7.75" and 21'7.25" to 24'8.25", respectively. Except for the variation in the distance of the toe behind the board, no distinct differences were noted. An alternate method of comparison was proposed. The adjusted length of each jump was determined by adding the recorded jump length to the distance of the toe behind the board. Comparisons were made between mean values for the groups containing the 7 longest and 7 shortest adjusted jump lengths and also between groups with the 4 longest and 4 shortest distances. No distinguishing differences were apparent in either comparison. It was concluded that there were too many interactive factors operating in this homogeneous group of athletes which prevented the identification of simple factors to describe optimum performance in the long jump. However, the repeated measures obtained across individual performances noted the degree of consistency attained by each athlete in each of the specific variables studied. Thus, the results were considered to be of benefit in improving individual performances.

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**March 16, 1979**

**9:30 am**

A COMPARATIVE ANALYSIS OF WALKING PATTERNS OF CHILDREN. Susan Van Dyke, Temple University.

This study represented a motor learning project which attempted to isolate minute movement variations of the infant gait. In-depth comparisons were made of the walking patterns of three varied-aged subjects on the task of walking barefoot, and walking while using shoes. Descriptive gait differences were observed through the analysis of a 16 mm film sequence, photographed with a Bolex camera, at a speed of 64 frames per second. Analyzation was accomplished on the Vanguard Motion Analyzer, with x and y coordinates taken for the thigh, knee, ankle, and toe of the right leg for each subject. Coordinates were transferred to computor cards with the final analysis representing angle differences of each child while walking barefoot and wearing shoes.

Major Results:

1. Bi-pedal locomotion was considered developmental in nature with the 36 month old child assimilating a mature adult walking pattern.
2. Movement variability among subjects was more pronounced when walking barefoot. In general, among all subjects, walking with shoes appeared to represent a smoother, more integrated step.
3. Although variability was noted in the comparison of walking patterns of all subjects, the difference decreased significantly between subjects with an increase in age.
4. Finally the most profound observation: The 12 month old subject displayed greater control when walking in specially designed baby shoes. There was a marked elimination of wavering in the legs at the beginning and end of each step. This was not observed in the analysis of the other subjects.

It appears that walking in shoes once independent bi-pedal locomotion has been achieved, allows the accomplishment of a more efficient gait. This was especially evident in the youngest subject. This finding is especially valuable in that it reinforces a concern for parents to provide appropriate footwear for infants just beginning bi-pedal locomotion. It should also be noted, that when a child reaches the point of walking assimilating a mature adult gait, there is reduced variability to a point of no observable difference, between walking barefoot and walking with shoes.

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March 16, 1979
9:45 am

# CINEMATOGRAPHIC ANALYSIS OF THE CENTER QUICK HIT IN VOLLEYBALL[1]

Robert Shapiro; Allen E. Brue, Northern Illinois University

The recent success of Eastern European athletes at international competitions has caused a reevaluation of the role of sport science in the preparation of American athletes. This past summer the United States Volleyball Association and Northern Illinois University funded a project to analyze volleyball spiking. Examination of the literature indicated a dearth of literature relating to the mechanics of spiking. The literature that was available was conflicting and concentrated on the motion of the ball rather than the performance of the player. Therefore, with the aid of the United States Mens National Coach this study was designed. The purpose of this study was to examine the kinematics of the center quick hit. The subjects for this investigation were members of the United States Men's National Volleyball Team. Standard high speed cinematographic techniques were utilized to obtain a record of performance for both the spiker and setter. Films were taken at the Olympic Training Center in Colorado Springs. Coordinate data were extracted using a Numonics Digitizer on line with the N.I.U. campus I.B.M. computer. Appropriate kinematic information was obtained from the position, time data. All subjects exhibited similar movement patterns. Horizontal velocity at take-off for the last stride ranged from 2.4 m/s to 3.3 m/s. At contact, horizontal velocity for the spikers ranged from -.3m/s to .9 m/s. Take-off to the jumping phase of the spike was observed prior to the ball being received by the setter in a majority of trials analyzed. The setters held the ball in their hands from .08s to .14s. Velocities of spiked balls ranged from 17 m/s to 23 m/s. Based on the results of this study the following conclusions were made:

1. The kinematic patterns exhibited by the subjects were very similar.
2. In successful hits the ball was released by the setter after the spiker left the ground in the jumping phase of the hit.
3. Ball velocities for the spike were similar to those reported in the literature.

---

[1] This research was supported by grants from Northern Illinois University and the United States Volleyball Association.

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**March 16, 1979**
**10:00 am**

**DEVELOPMENT AND USES OF COMPUTER-GENERATED GRAPHICS OF THE HUMAN FORM.** Eugene W. Brown, California State University, Los Angeles; Mel E. Finkenberg, California State University, Los Angeles.

The purpose of this study was to devise a procedure for generating graphics of the human form via computer techniques. Graphics are pictorial displays. Tables, graphs and drawings are examples. Functionally, graphics can provide an ease in the comprehension of complicated and abstract ideas which often require lengthy verbal descriptions. Drawings of the human form are found in numerous physical education manuscripts. A preponderance of these drawings are either reproductions of free hand sketches or are hand drawn copies of existing photographic images. Graphics representing the human form are extremely important to the physical educator; they provide a means of communicating the form and position of the body without necessitating the use of lengthy and sometimes ambiguous anatomical descriptions. Graphics can bridge a communications gap between physical educators and other professionals who may not be well versed in anatomical nomenclature. A FORTRAN program was written for the CalComp Plotter. High speed cinematography was utilized to obtain photographic images of the human figure engaged in physical activity. Selected frames of this motion picture were digitized to provide x and y cartesian coordinates used as input for the computer program. The plotter then drew the body form by connecting the data points. Several attempts at digitizing a selected figure assisted in the development of procedural guidelines for selecting and spacing data points. Numerous selected groups (including skilled-unskilled, handicapped-normal, male-female, and elementary-mature movement patterns) were compared with respect to the computer-generated graphics on selected movement phases. It was concluded that the use of computer-generated graphics of the human form is a viable alternative to traditional visualization strategies used by physical educators.

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**March 16, 1979**
**10:15 am**

## WOMEN IN SPORT IN THE ANCIENT WESTERN WORLD IN THE BRITISH MUSEUM.

Reet A. Howell and Janet Rounds, San Diego State University.

The evidence of women in sport in art of the British Museum was examined. The research was limited to the ancient western world, specifically the Sumerian, Babylonian, Hittite, Assyrian, Egyptian, Mincan, Myceneaen, Greek, Etruscan, and Roman civilizations. The time period covered was, roughly, from 4000, B.C. to 500 A.D. The historical method of research was utilized, supplemented by a series of personal visitations to the British Museum. Slides will be shown to depict the more important evidence. The search for and the analysis of primary information is essential for sport history. Thus, systematic analyses of the art and artifacts in the museums of the world, with correct identification, is needed to provide relevant primary information is essential for sport history. Thus, systematic analyses of the art and artifacts in the museums of the world, with correct identification, is needed to provide relevant primary information and add to the existing body of knowledge. The British Museum, in existence since 1759, is certainly one of the most important museums in the world. Of particular significance are the collections of the Ancient World which include such world known pieces as the Townley marbles, the Elgin marbles, the Rosetta stone, the Assyrian sculptures from Nineveh, and the bas-reliefs from the palace of Ashurbanipal to name but a few. On the sculptures, bronzes, terra-cottas and other artifacts are represented numerous sporting scenes which add to our understanding of sport in these various societies. Very little work has been done on the correct identification and classification of such material. This study analyzed the evidence pertaining to women and identified those artifacts which depicted women participating in various sporting and recreational activities, as well as dance in the ancient western world. Many of these artifacts have never been described, nor mentioned in the literature. Evidence was found of dance, gymnastics, running, swimming, horseback riding and playing of games.

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March 16, 1979
10:30 am

**WOMEN IN SPORT IN THE UNITED STATES, 1900-1914. Maxwell L. Howell and Reet A. Howell, San Diego State University.**

The role and relevance of women in sport in the United States over a fifteen year period, from 1900 to 1914 was examined. The historical method of research was utilized and two periodicals being researched for the stipulated time period, Colliers and the American Physical Education Review. These were markedly different magazines. Colliers, called the National Weekly, was a widely-circulated and well-read magazine, appealing largely to the better-educated person. Its editorials were of particular significance, as they campaigned, reformed, and criticized. The American Physical Education Review was a professional magazine, stressing articles on the growth of physical education in schools and colleges, the need of standards for teachers, history of physical education and so on. The changing role of women was clearly evidenced in this period. By 1914 the male monopoly of the voting booth had been broken in eleven states, and similar changes were emerging in other areas of society. Changes in dress habits were one reflection of the new society; dress that restricted movement and limited work being obviously of little use in a more mobile society where more women were doing men's work. The Moseley Commission concluded that men were becoming more effeminate and women more masculine, and much of the increased effeminacy was thought to be related to "the number of women teaching in our schools." Nineteenth century attitudes still prevailed and were promulgated in many instances by male physical educators. Luther Halsey Gulick felt that athletics did not test womanliness as it did manliness, and that women would gain little imitating the work and manner of men. Dudley Allen Sargent re-affirmed these traditional beliefs. It was felt that: "The playground of the older girls should, if possible, be screened from public view by buildings, shrubs, and vines." Mid-Victorian attitudes were held by most of the "experts." Fortunately, progressive women ignored such statements and looked for worlds to conquer. Baseball for women was "growing in favor from season to season," as was women's crew, hockey, archery, tennis, swimming, aviation, roller skating and mountain climbing. It was concluded that there was no single cause that brought on this awakening, but a complex array of interrelated causes. Industrialization, urbanization, invention, education--each played its part. The physical education professors played a conservative role during this period of change, and it was a role in conflict with the progressive women's movement.

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March 16, 1979
11:00 am

## "A CHILD MUST PLAY"--EARLY PESTALOZZIAN EFFORTS IN THE UNITED STATES.

Roberta J. Park, University of California, Berkeley.

The often-heard assertion that Pestalozzianism arrived in the United States with the "Oswego Movement" of the 1860s overlooks important events which occurred during the early decades of the 19th century. During the early 1800s the topic of education (and physical education) received considerable attention in America. Among the foreign systems frequently discussed was that of the famous Swiss educator Johann Heinrich Pestalozzi. Information regarding his Burgdorf and Yverdon schools--as well as schools of his disciples--began to filter into America as early as 1806. The earliest introduction seems to have been when William Maclure published an article in the *National Intelligencer*. Maclure also persuaded Joseph Neef, a former teacher at Burgdorf, to emigrate to America in 1806. By 1809 Neef had established a short-lived school at which Pestalozzian theory concerning play, games and physical education was put into practice. In 1808 Neef wrote what may be the first pedagogical book written and published in the English language in America. It contained a chapter "Gymnastics and Exercise." In 1823 John Griscom's *Year In Europe* described Pestalozzi's work in Switzerland and advocated a better program of physical education for American children. Early issues of William Russell's *American Journal of Education* (begun in 1826) included articles authored by a number of individuals who were familiar with Pestalozzi's educational theories. So did William Woodbridge's *American Annals of Education*, which succeeded Russell's journal. Amos Bronson Alcott, often called "The American Pestalozzi," was convinced that *play* was one of the most valuable developmental experiences that a child could have. Alcott was, in fact, a pioneer in the development of the child-centered school concept (sometimes compared to John Dewey).

While it may be difficult to determine with absolute certainty how much the views of men like Maclure, Neef, Russell, Alcott and others regarding the developmental value of play and physical activity were influenced by Pestalozzi's educational theory, it can be clearly documented that a substantial number of leaders of early American education were familiar with the writings and/or the actual schools of the famous Swiss educator. Certainly the educational theories of Johann Heinrich Pestalozzi (and his beliefs regarding the developmental value of play and physical activity) were known in the United States long before the 1860s.

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March 16, 1979
11:15 am

## SPORT SYMBOLS IN POLITICAL COMMUNICATION: D.B. Van Dalen, University of California, Berkeley

Scholars have probed many facets of the function of sports, but they have given little attention to how sport symbols and body image are employed to transmit political messages in the communication media. To gain some insight into this function of sport, an analysis was made in this study of political cartoons obtained from newspapers and magazines published in the United States in the past two decades. Slides (35mm) were made of the cartoons to facilitate the analysis and to illustrate the presentation. Therories and studies relating to humor, communication, and body image provided the conceptual framework for the study. Humor was examined from motivational, cognitive, emotional sociological, and other approaches. The data revealed that many different sports, ranging from archery to yachting and from archaic chivalric sports to jogging and backpacking were employed to communicate messages, but football, baseball, boxing, and racing, in that order appeared most frequently. Among the symbols manipulated to transmit political messages were players, coaches, referees, teams, game plans, sport arenas, score boards, playing and protective equipment, game signals, player injuries, infractions of rules, and distortions of body images. Sport symbols were used to promote or block the candidacy of politicians; to enlighten the public about the strengths and weaknesses of leaders or proposals; to expose immoral, unethical, or incompetent conduct; and to reveal the difficulties and dangers encountered in struggling with competing concepts concerning the solution of political problems. The data revealed that sport imagery provides not only a variety of shorthand cognitive cues that can easily and quickly be processed by people of all ages, races and educational backgrounds, but also many affective cues that arouse innerbody physical and psychological sensations and memories of interpersonal cooperative, competitive, and dominance relations in sport that add an emotional dimension to the communication process.

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March 16, 1979
11:30 am

# *NIPPON-TO (THE JAPANESE SWORD): TRANSITION FROM WAR TO SPORT*

*Richard J. Schmidt, School of HPER, University of Nebraska*
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*The purpose of this paper is to investigate the evolution of Japan's oldest martial tradition, swordsmanship, showing its transition from use as a "weapon of war (kenjutsu)" to a "weapon of sport (kendo)." Martial tradition has played a significant role in the historico-cultural development of sport in modern Japan. Once practiced as lethal forms of military combat by the samurai, the 20th century cognate forms of bujutsu ( martial arts) such as judo, karatedo, and kendo are today practiced the world over for purposes of self-defense, spiritual discipline, physical education and sport. Although material exists describing these disciplines as methods of combat, there exists a paucity of research in the western literature regarding their transition from forms of war to forms of sport. The historical and empirical methods were utilized. Data for this investigation were researched from primary and secondary sources concerned with Japenese educational, religious, historical, political and military affairs. Personal visitations were also made to selected kendo dojo (schools) in Japan. Findings indicated that the transition of kendo in Japan from a form of war to a form of sport was influenced by the following: 1) the establishment of the Tokugawa Shogunate, 2) introspective inquiry by noted kenshi (swordsmen) into the philosophical moral-ethical basis of their art, 3) the development of protective equipment between 1700 and 1800 A.D., 4) issuance of bakufu (tent government) orders rescinding earlier bans on sword duelling 5) the Meiji restoration of 1868, 6) individual and government-sponsored support of Kendo as a sport, 7) educational directives requiring kendo as a mandatory aspect of physical education, and 8) the formation of the All-Japan Kendo Federation in 1928. It was concluded that the establishment of the Tokugawa Shogunate and the Meiji restoration served as primary factors which gave impetus to the transition of kendo from a form of war to a form of sport.*

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March 16, 1979
11:45 am

PHENEMONOLOGY IN USE: A PHYSICAL EDUCATION EXAMPLE. Carolyn A. Martin, California State College, San Bernardino; Peter Spader, Marywood College, Scranton, Pennsylvania.

This study was designed to offer the concept of phenemonology as a tool in determining the intrinsic processes involved in sports and game participation. Specifically, the information will concern current knowledge in the area of physical activity as part of the lived experience of a whole person. It is the opinion of the authors of this paper that the philosophical concern. The major objectives of the paper are 1) to present a current philosophical idea in a form both palatable and understandable to the physical education researcher and the physical education practitioner. 2) To point out the connection between the human aspects of sports and the philosophical aspect of the lived experience of whole persons. In general, phenemonology provides an approach which may help to reawaken each one of us to what it is to be a live and experiencing human being, and thus reawaken in us a sense of new possibility.

Ms. Carolyn A. Martin
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March 16, 1979
12:00

A MODEL FOR SPORT AND DANCE. Jack Hutslar, University of North Carolina at Greensboro.

Play is frequently considered the basis of sport, and sport and dance are usually considered separate entities with little relationship to one another. The purpose of this paper was to present a model for conceptualizing sport and dance as a common phenomenon separate from the domains of psychology, sociology, history, biology and geography. Performance was viewed as the basis of this shared relationship. Some support was offered from the literature for viewing sport and dance as the performance of skill. Skill in a given activity was considered a generic trait of sport and dance with levels of skill or ability a hierarchial, unique and essential characteristic of the model. The levels within the model were beginner, intermediate and advanced performance as we traditionally label our courses. The philosophy which most represents sport and dance was argued to be that of existentialism. The function of the model was to propose that sport and dance might be considered as a discrete domain with a body of knowledge upon which a theory of performance in sport and dance could be built. The paper was concluded by identifying some plausible hypotheses worth studying; by offering some a priori propositions about sport and dance; and by stating a working definition for sport and dance. That definition states that sport and dance is a contrived or artificially created, physically active movement or performance, of varying complexity or skill level, undertaken by a person or between people, against another person(s) or obstacle, artificial or natural, traditionally competitive but also expressive, and with the outcome of the performance uncertain.

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March 16, 1979
12:15 pm

*METABOLIC MEASUREMENTS ASSOCIATED WITH STEADY STATE RUNNING: EFFECTS OF NORMAL OR HIGH FAT-PROTEIN DIETS ON HIGHLY TRAINED MALE AND FEMALE DISTANCE RUNNERS. Phillip A. Sienna, University of Nebraska-Lincoln, A. Garth Fisher and Robert K. Conlee, Brigham Young University.*

The purpose of the investigation was (1) to determine if there was a difference in various selected metabolic measurements associated with steady-state running in highly trained male and female distance runners subjected to either a normal or low carbohydrate, high fat-protein diet and (2) to determine the percent maximum oxygen uptake ($VO_2$) for males and females during steady state running. Four male and four female highly trained distance runners from Brigham Young University served as subjects. A battery of four tests were administered to each subject. The first test consisted of a graded treadmill run to determine maximum aerobic capacity (Max $VO_2$). The second test was a 10-mile road race to determine optimum steady-state aerobic ability. The third and fourth tests consisted of a 10-mile treadmill run, one while the subjects were consuming a normal diet and one (48 hrs. later) while the subjects were in a glycogen depleted state and consuming a high fat-protein diet. A catheter was inserted into a forearm vein and blood samples were drawn during the third and fourth tests at the following intervals: pre exercise, 2, 4, 6, 8, 10 miles of the exercise period, 5, 10, 20 minutes post exercise recovery. Dependent variables analyzed during the third and fourth tests were (1) percent of road race pace, (2) percent of aerobic capacity, (3) glucose, (4) lactate and (5) respiratory quotient (R). A multivariate and a series of univariate analyses were applied to the data. The results and analyses indicated the following: (1) men and women perform at approximately the same percent of their aerobic capacity during steady state running (75-80%), (2) men and women were not able to maintain their 10-mile road race pace during either of the two 10-mile treadmill runs, (3) diet significantly affected percent aerobic capacity, glucose, lactate and R. It was concluded from the investigation that: (1) there was no difference in selected metabolic measurements associated with steady-state running in highly trained male and female distance athletes, (2) a high fat-protein diet is less efficient and more demanding aerobically than a normal diet and, (3) during steady state running, men and women perform at approximately the same percent of their aerobic capacity.

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March 16, 1979
1:00 pm

A COMPARISON OF CAPILLARY ULTRASTRUCTURE IN FAST AND SLOW TWITCH SKELETAL MUSCLE AND MYOCARDIUM OF RAT. Thomas Manfredi, Southern Connecticut State College; D.W. Edington, Kathleen O'Connor, University of Michigan, Ann Arbor.

The purpose of this study was to observe the capillary endothelial substructure in fast twitch plantaris, slow twitch soleus, and cardiac muscle from rats. Skeletal and myocardial muscle cubes were taken from male rats approximately 300 days old and examined under an electron microscope. While the capillary lumen diameters in heart, soleus, and plantaris were very comparable, the capillary area occupied by the endothelium was 27%, 30.4%, and 36.3%, respectively. The mean pinocytotic vesicle size in all muscle were similar while the vesicle distributions in cardiac and soleus muscles showed more homogeniety in sizes when compared to plantaris. Furthermore, the percent endothelial area occupied by vesicles in cardiac (17.6%) and soleus (16.5%) were significantly greater than in plantaris (12.6%). If an attempt is made to relate various capillary substructural components to the degree of oxidative capacity of muscle, there appears to be a trend in which the more oxidative tissue possesses capillaries which have a lesser percent of their area occupied by endothelium and a greater concentration of pinocytotic vesicles within their endothelium. Furthermore, electron micrographs of heart muscle capillaries clearly show that their pinocytotic vesicles fuse with the endothelial membranes, a factor which does not occur in skeletal muscle. This finding suggests different mechanisms of transport in skeletal and cardiac capillaries. Capillary morphometric data in conjunction with capillary membrane-specific stains show promise as a means of assessing tissue specificity in control animals and tissue responses to training and aging.

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**March 16, 1979**
**1:15 p.m.**

EFFECTS OF WORK LOAD AND BLOOD LACTATE CONCENTRATION UPON RECOVERY FROM EXERCISE. George A. Brooks, Steven S. Segal, Exercise Physiology Laboratory, Department of Physical Education, University of California, Berkeley.

To study selected physiological responses during exercise and recovery, eleven male subjects exercised on a bicycle ergometer at moderate and heavy workloads in both normal glycogen (NG) and glycogen depleted (GD) states. At rest, GD resulted in significantly lowered blood glucose and lactate concentrations, $\dot{V}CO_2$, R, and VE. With the exception of [glucose], these parameters showed a greater response to heavy exercise (HE:2 min. @ X=1750 kpm/min) than to moderate exercise (ME:2 min. @ X=1000 kpm/min). At either workload, with the exception of $VO_2$, the observed parameters showed consistently greater responses in the NG state. The rate of the initial component of recovery $VO_2$ was unaffected by either workload or the presence of lactate. During the later phases of recovery, $VCO_2$, R, and VE values following HE fell below those of ME. At the end of 30 min. of recovery from HE, $VO_2$ had declined below initial resting values, yet [lactate] was still significantly elevated. Although the slow component of recovery $\dot{V}O_2$ was enhanced following HE, it was not affected by the level of lactate. Exercise intensity was the predominant factor influencing the magnitude and kinetics of recovery $VO_2$.

Supported by NIH grant AM19577.

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March 16, 1979
1:30 pm

# EXERCISE RECOVERY: LACTATE DISAPPEARANCE AND SUBSEQUENT PERFORMANCE.

Arthur Weltman, Bryant A. Stamford Charles Fulco, Exercise Physiology Laboratory, University of Louisville, Louisville, Kentucky 40208

In order to examine the effects of differing recovery patterns (following maximal aerobic exercise) on blood lactate disappearance and subsequent performance nine subjects completed an incremental $\dot{V}O_2$max test and four experimental sessions. The experimantal sessions consisted of a 5 min maximal aerobic performance test, on the bicycle ergometer, followed by a randomly assigned recovery treatment of 20 min duration and a subsequent 5 min maximal aerobic performance test. Blood lactate levels were measured at rest and during min 5,10,15 and 20 during recovery. The recovery patterns consisted of passive recovery (PR), active recovery below the anaerobic threshold (AR $<$ AT), active recovery above the anaerobic threshold (AR $>$ AT), and active recovery above anaerobic threshold while breathing 100% oxygen (AR $>$ AT + $O_2$). Results indicated that the AR $>$ AT + $O_2$ recovery condition resulted in significantly greater lactate disappearance than the other three treatments ($p < .05$). Preexisting blood lactate levels prior to subsequent performance were significantly different across treatments ($p < .05$). Comparison of the prerecovery and post recovery revolution and work output scores revealed no significant treatment effects. Further analysis indicated no significant differences between work output on the pre vs. postrecovery test ($p > .05$). $\dot{V}O_2$ and HR were significantly higher and $\dot{V}CO_2$ and the R value were significantly lower ($p < .05$) during the postrecovery test. It was concluded that 1) recovery exercise at the greatest % of $\dot{V}O_2$max, not accompanied by recovery lactate accumulation is optimal with regard to blood lactate disappearance; 2) inhalation of 100% oxygen during recovery permits a greater % of $\dot{V}O_2$max during recovery (before recovery lactate accumulation occurs) and therefore aids lactate disappearance; 3) elevated preexisting levels of blood lactate have little effect on subsequent performance.

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March 16, 1979
1:45 pm

# HEART MITOCHONDRIA PROFILES IN AGING AND TRAINED MALE RATS

M.J. Welch, Southern Connecticut State College and D.W. Edington, University of Michigan.

Mitochondrial distributions within the perinuclear, myofibrillar, and cell border regions from the myocardium of male rats were compared during a sedentary aging process as well as during a long term low threshold exercise program (running at 20 meters/minute for 20 minutes for 600 days). The age at initiation of the exercise program varied - 150 days, 300 days, and 450 days.

During the aging process, there was a 23% reduction in mitochondrial numbers and a 20% increase in size within the myofibrillar area. Similar changes were found within the cell border region (17% reduction in number, 28% increase in size).

However, a comparison of the mitochondria among the three regions showed very little differences during the aging process. Mitochondrial numbers within the three regions differed only by 14% at 150 days, 4% at 300 days, and 6% at 900 days. Likewise, size differed little among the three regions. The mitochondria at 150 days of age differed in size by 9.5%, at 300 days by 8%, and at 900 days by a significant 27%. This was due largely to the much smaller organelles in the perinuclear region.

As a result of the training program, the trained animals possessed mitochondrial profiles more similar to young sedentary animals than their age matched peers. This was shown by smaller sized organelles. However, among the three regions there was a slight difference in sizes with a 17%, 17%, and 19% differences respectively in those animals which began training at 150 days, 300 days, and 450 days of age. Again, this difference was largely due to smaller mitochondria in the perinuclear region. Very little difference among the three regions were found in mitochondrial numbers. Therefore, it appears that mitochondrial changes are probably not confined to specific regions, but the entire myocardial cell.

Supported by NIH Grant HL21633-01

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March 16, 1979
2:00 pm

THE RELATIONSHIP OF MAXIMAL ISOMETRIC STRENGTH WITH FIBER TYPE COMPOSITION IN MEN AND WOMEN ENDURANCE ATHLETES. Priscilla M. Clarkson, Walter Kroll, Anthony Melchionda, University of Massachusetts, Amherst.

The relationship of knee and ankle extension isometric strength with fiber composition of the vastus lateralis (v.l.) and gastrocnemius (gastroc.) muscles was examined in seven men and seven women endurance athletes. The percentage of slow twitch (ST) and fast twitch (FTa and FTb) fibers was determined from muscle biopsies. Knee extension strength in men (65.6 Kg.) was significantly greater ($p < .05$) than in women (47.2 Kg.) Although no significant difference was found between men and women in ankle extension strength, the actual strength measure for men was 130.3 Kg. and for women was only 97.0 Kg. Fiber type composition of the v.l. and gastroc. muscles was very similar in men and women. The percentages of ST, FTa and FTb fibers in the v.l. were found to be 57.1%, 35.9% and 7.0% for women and 69.8%, 27.3% and 2.6% for men. The corresponding percentages in the gastroc. were 65.0%, 32.0% and 3.0% for women and 70.6%, 28.5% and 0.5% for men. Percent ST fibers in the v.l. correlated .59 with knee extension strength for the combined groups; when analyzed separately, this correlation was .63 for men and only .24 for women. The correlation between percent ST fibers of the gastroc. and ankle extension strength was .51 for combined groups, .49 for women and -.19 for men. Thus, men had a higher correlation between percent ST fibers of the v.l. and knee extension strength compared to women, while the reverse was true for the relationship of gastroc. ST percent and ankle extension strength. These findings suggest a predominant involvement of ST fibers in the production of 1) ankle isometric strength for women, and 2) knee extension isometric strength for men. Also, the relationship to be expected between muscle fiber composition and maximal isometric strength may well depend upon sex as well as the specific muscle group under study.

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**March 16, 1979**
**2:15 pm**

**MUSCLE FIBER TYPE COMPOSITION AND ISOMETRIC ENDURANCE OF POWER AND ENDURANCE ATHLETES.** Gary Kamen, Priscilla M. Clarkson, Walter Kroll, University of Massachusetts, Amherst.

Recent investigations have demonstrated a significant correlation between muscle fiber type composition and physical performance capabilities. High-strength, power athletes are generally characterized by a preponderance of fast-twitch (FT) muscle fibers, while endurance athletes generally have an abundance of slow-twitch fibers. Much of the work relating fiber type composition with physical performance capabilities has been restricted to analysis of the vastus lateralis muscle of the large muscle group responsible for knee extension. In an effort to extend this research to another, smaller muscle group involved in physical performance, a study was conducted to compare power and endurance athletes in plantar flexion strength and isometric endurance. The subjects consisted of eight weightlifters and seven long distance runners. Plantar flexion strength was measured with the ankle at an angle of 90 degrees over a period of four days for baseline stabilization. On the fifth day, each subject was administered an isometric holding-time task in which he was required to hold a weight corresponding to 50% of the individual's maximum isometric strength for as long as possible. The exercise task was performed three times with a four minute rest between each bout. Results showed that the weightlifters had greater plantar flexion strength than the runners (440.0 lbs. versus 278.7 lbs.). In addition, while the runners possessed mostly ST muscle fibers (70.6%), the weightlifters had significantly fewer ST fibers (47.0%). Mean endurance times averaged over the three bouts were 70.0 secs. for the weightlifters, and 133.5 secs. for the distance runners. A significant positive correlation was found between holding time and proportion of ST muscle fibers (r=.55). It was concluded that a definite relationship exists between muscle fiber type composition and isometric endurance, which is in accordance with the principle of specificity of training.

Gary Kamen
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March 16, 1979
2:30 pm

THE ENERGY COST AND HEART RATE RESPONSE TO STATIC AND DYNAMIC LEG EXERCISE IN FEMALES. Patricia Long Danoff, University of Maryland Department of Physical Education.

The purpose of this study was to compare the energy cost and heart rate response to variable-load static and dynamic leg exercise. Young adult women (N = 5) performed five-minute bouts of static (isometric) and dynamic (isotonic) leg extension while in a sitting position on a weight-loaded dynamometer. The static loads were 50, 60, 70, and 80 lb, and the dynamic loads were 30, 40, 50, and 60 lb. A knee angle of 115 degrees was maintained during static work. During dynamic work the knee angle ranged from 90 to 140 degrees, and a cadence of 20 rpm was employed. A Quinton ECG Monitoring System and a Beckman Metabolic Measurement Cart were used to obtain data at 30-second intervals during five-minute rest, exercise, and recovery periods. Results indicated that oxygen consumption and heart rate increased as an apparently linear function of workload for both types of exercise. Mean $\dot{V}O_2$ ranged from 1.72 - 2.20 METS for static, and 1.92 - 3.01 METS for dynamic exercise. Mean HR ranged from 84 - 106 bpm for static, and 87 - 101 bpm for dynamic work. When the two types of exercise were compared at equal workloads, the dynamic work was found to elicit significantly greater levels of oxygen uptake and heart rate. The metabolic energy cost increased as an apparently linear function of workload for both types of exercise. The net energy cost in kilocalories ranged from 0.90/min - 1.67/min for static, and 1.07/min - 2.50/min for dynamic work. The energy cost of dynamic exercise was significantly greater and approximately twice that required by static exercise using the same workload. Based upon the above results it was concluded that bouts of static and dynamic exercise which employ equal loads for an equal period of time are not physiologically equal or directly comparable since the energy cost and heart rate response to dynamic work is greater.

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March 16, 1979
2:45 pm

**CARDIAC OUTPUT ESTIMATION IN CHILDREN BY CARBON DIOXIDE REBREATHING: AN EVALUATION OF MEASUREMENT TECHNIQUES AND METHODS FOR THE CALCULATION OF ARTERIAL AND MIXED VENOUS CARBON DIOXIDE CONTENT OF THE BLOOD.** W.F. Riner, Jr.,; R.H. Geeseman; and R.A. Boileau; Physical Fitness Research Lab, University of Illinois at Urbana-Champaign.

The purpose of this investigation was to compare various non-invasive methods and techniques of estimating exercise cardiac output, in children, by carbon dioxide rebreathing to values reported in the literature obtained by dye-dilution techniques. The data evaluated in this investigation were obtained during exercise testing of 7-12 year old boys and girls. Data for the estimation of $PvCO_2$ were obtained by the equilibrium (plateau) technique of Collier (n = 24) and by the exponential technique of Defares (n = 70). Both submaximal and maximal exercise levels were measured with the exponential technique, while only submaximal values were obtained by the equilibrium technique. Approximately 15 seconds of expired $CO_2$ were recorded breath by breath immediately preceding rebreathing for the estimation of $PaCO_2$. Both end-tidal and Bohr methods were applied to obtain $PaCO_2$ values from data taken by both techniques. $PvCO_2$ values determined by the equilibrium technique were considered both with and without a "downstream correction" being made for the assumed alveolar to arterial $PCO_2$ differences when no $CO_2$ exchange is occurring across the lungs. The results of the investigation revealed that $P\bar{v}CO_2$ values determined by the equilibrium technique and calculated using the "downstream correction" and $PaCO_2$ values calculated with either the Bohr or end-tidal methods resulted in cardiac output values of similar magnitude and comparable to those obtained by dye-dilution. When the exponential technique was used to determine $PvCO_2$, the values of cardiac output compared most favorably with those determined by dye-dilution when the end-tidal technique was used to calculate $PaCO_2$. No "downstream correction" was applied to the calculation of $PvCO_2$ when the exponential technique was used due to the assumption that there is no alveolar to artierial $PCO_2$ difference during continuous gas exchange.

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March 16, 1979
3:45 pm

BIOLOGICAL VARIATION IN $VO_2$ MAX. Stanley P. Sady, Victor Katch, Patty Freedson, University of Michigan.

To study the extent of biological variation in $VO_2$ max, 5 trained subjects (4 females, 1 male) were tested approximately 20 times on a continuous, step-increment treadmill test to volitional exhaustion. $VO_2$ max was determined using the Douglas bag method. Of the 80 maximal tests administered 61 percent resulted in $VO_2$ values meeting the criteria for "true" $VO_2$max. Biological variation was determined as the S.D. of an individual's $VO_2$ max scores. Experimental error (variable error of the instruments) was determined for each piece of equipment in repeated experiments using reference gases. Results revealed that biological variation accounted for 90 percent or more of the ± 5 to 8 percent variability in $VO_2$ max within an individual. Experimental error accounted for less than 10 percent of the variability. These data point to the relative reproducibility of $VO_2$ max, and suggest (1) that most of the variability in $VO_2$ max observed among subjects is due to true individual differences, and (2) because of biological variability control data are needed in training studies where $VO_2$ max is used as a dependent measure.

Stanley P. Sady
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March 16, 1979
3:30 pm

## EFFECT OF ALCOHOL ON CARDIORESPIRATORY FUNCTION. Vernon J. Bond.

There are contradictory reports concerning the effects of alcohol on physical performance. The numerous measures associated with physical performance, such as heart rate, oxygen consumption and endurance, demonstrate varying degrees of reactions to the ingestion of ethyl alcohol. The purpose of this study was to examine the acute effects of alcohol on heart rate and oxygen consumption before, during, and after a progressive bicycle ergometer ride to voluntary exhaustion. Male university students, light (N=5) and moderate (N=5) drinkers served as subjects and underwent three separate trials of a work task consisting of three minutes each at 360, 720 and 1,080 Kpm/min, with the last work rate continuing to exhaustion. Prior to each trial, the subject consumed either a placebo (0cc/lb.), small (.2cc/lb.), or moderate (.4cc/lb.) does of ethanol, mixed as a 20 percent solution in grapefruit juice. Heart rate and oxygen uptake were determined at rest, during exercise, and in recovery. Measure of endurance (time to exhaustion) was recorded as work performed beyond the third minute at 1,080 (Kpm/min) work load, maintaining a pedal rate of 60 Rpms. The overall analysis by two way ANOVA supported the conclusion that neither a small nor moderate dose of alcohol significantly affected endurance or heart rate and oxygen uptake during rest, exercise, or recovery.

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**March 16, 1979**
**3:45 pm**

# CONTROL OF VENTILATION DURING LONG-TERM EXERCISE.

Bruce J. Martin, Edward J. Morgan, Clifford W. Zwillich, and John V. Weil, University of Colorado Medical Center.

Ventilation ($\dot{V}_E$) steadily increases without reaching a plateau during heavy long-term exercise at a constant work load. This ventilatory drift has important implications both for endurance athletic performance and for the adequacy of gas exchange during prolonged work. Although the mechanism responsible for the progressive $V_E$ rise remains unexplained, it has been suggested that it may result from stimulation of the respiratory center by the increase in central body temperature that accompanies long-term exercise. To test this possibility, we measured $\dot{V}_E$ in 10 healthy males at a cycle ergometer work rate of 150 watts before and after elevation of rectal temperature ($T_{re}$) by either 1) 47 minutes of heavy exercise, or 2) passive heating in a bath. In both phases of the study mean $T_{re}$ was raised 0.8°C. We found that exercise-induced $T_{re}$ rise increased $\dot{V}_E$ at the 150 watt work load from 62.0 ± 3.0 to 67.1 ± 2.9 l/min BTPS ($P < 0.05$), a result consistent with the existence of an exercise-induced ventilatory drift. However, elevating $T_{re}$ by heating in a bath left exercise $\dot{V}_E$ unchanged at the same work rate, indicating that passive core temperature rise fails to produce a ventilatory drift. This result suggests that the drift in $\dot{V}_E$ during prolonged heavy exercise at a constant work rate is not directly due to increased central body temperature. (Supported by NIH Grant HL 14985)

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March 16, 1979
4:00 pm

# THE EFFECTS OF ELECTROMYOGRAPHIC FEEDBACK AS A RELAXATION TECHNIQUE ON THE METABOLIC RESPONSES TO SUBMAXIMAL EXERCISE.

Ronald G. Knowlton, Michael D. Cohen, Joel Thirer. Southern Illinois University, Carbondale, IL

The purpose of this study was to determine if electromyographic biofeedback (EMBF) could alter the physiological efficiency (PE) of subjects during submaximal exercise. Fourteen subjects who demonstrated significant resting frontalis muscle action potential were administered a bicycle ergometer test to determine maximal aerobic power. Ten subjects were randomly selected to serve as experimentals and four subjects served as controls. All subjects were given pre and post tests at 40% and 70% of the workload which established their maximal oxygen uptake capacity. The experimental subjects participated in six sessions of EMBF training using the frontalis muscle during a span of two weeks. The subjects participated in the training while seated comfortably in a chair placed within an anechoic chamber. Although significant reductions for the treatment group occurred in the oxygen consumption of the two workloads $\underline{p} < .05$, the greatest reduction, from 31.8 to 26.3 $\text{ml/kg}\cdot\text{min}^{-1}$ was observed at 70% of maximum workload. Pulse rates decreased from 124 to 109 and 154 to 136 bpm which were significant $\underline{p} < .05$ at both workloads. Ventilation (BTPS) were significantly decreased only at the heavier workload. The only significant change noted for the control group was a decrease in pulse rate at the 70% level from 163 to 155 bpm. Neither group indicated a reduction in the perceived exertion at either workload as measured by the Borg scale. It was concluded that short term EMBF can increase the physiological efficiency of a subject to do submaximal exercise. The value of this conclusion would be its application in improving the tolerance for exercise of subjects physically incapable of exercise training.

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March 16, 1979
4:15 pm

## THE RELATIONSHIP BETWEEN ANAEROBIC POWER AND ALACTIC CAPACITY IN COLLEGE-AGE STUDENTS.

Maria V. Tahamont, Patricia I. Fitzgerald, Ronald G. Knowlton, Southern Illinois University, Carbondale, Ill. Michael N. Sawka, Wright State University, Dayton, Ohio.

The purpose of the study was to determine the relationship between anaerobic power and alactic capacity in 50 college-age students (32 male and 18 female). Subjects were timed as they ran an ordinary flight of stairs, 2 steps at a time. The fastest performance time was used to calculate maximal anaerobic power (margaria). Maximal alactic capacity was determined using net recovery $\dot{V}O_2$ calculated from ventilatory samples obtained after a short exhaustive run on a motor driven treadmill (Fox). Test-retest reliability was calculated for each performance measure, and tests were repeated with a minimum intervention of one day. There were no significant differences between tests 1 and 2 for maximal alactic capacity, the mean values were 92.85 cal/kg and 89.61 cal/kg for tests 1 and 2 respectively. The mean maximal anaerobic power values were 53.32 Kcal/min for test 1 and 55.66 Kcal/min for test 2, there were significant differences between these two tests, $t = 5.08$, $\underline{p} < .001$. The Pearson-Product Moment correlation between maximal anaerobic power and maximal alactic capacity, $r = .59$, was significant ($\underline{p} < .05$). The amount of variance accounted for by maximal anaerobic power ($R^2 = .35$) was relatively low indicating that only a portion of maximal alactic capacity could be utilized in exercise of short duration. The significant difference between the means of tests 1 and 2 for maximal anaerobic power indicates a learning effect. The practice effect should be taken into consideration in the administration of this test. A learning curve should be constructed to more accurately evaluate an individual's maximal anaerobic power.

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March 16, 1979
4:30 pm

EFFECTS OF CIRCULATORY OCCLUSION ON SUBMAXIMAL, ISOMETRIC ENDURANCE. Robert C. Serfass, G. Alan Stull, David Ben-Sira, University of Minnesota; Jay T. Kearney, University of Kentucky.

This study examined the effects on submaximal endurance of artificially occluding the blood supply to the hand-gripping muscles. Upon reporting to the laboratory for testing, each of the 26 male subjects was tested for grip flexion strength. Three strength trials were administered with a rest interval of 30 sec. interposed between successive trials. The mean of the three trials was taken as the subject's maximum voluntary contraction (MVC). Following a 2-min. rest interval, the subject then attempted to maintain for as long as possible a contraction at a tension equal to 35, 50, 65, or 80 percent of his MVC. Every subject was tested at all tension levels under normal circulatory conditions and with the circulation artificially occluded. Occlusion was accomplished by placing a blood pressure cuff around the upper arm and inflating it to a pressure of 220 mm Hg which was maintained until the prescribed level of tension could no longer be sustained. The bout was terminated when the subject's tension fell below the required level and could not be regained to that level within a period of three seconds. The time the subject persisted was recorded to the nearest second. A minimum of 72 hours intervened between successive testing sessions. The results of the 2 x 4 (blood flow x level of tension) analysis of variance with repeated measures across both factors yielded significant ($p < .05$) F-ratios for the main effect of blood flow, main effects of level of tension, and interaction between blood flow and level of tension. The significant main effect of blood flow indicated that when averaged across all levels of tension, the mean holding time under the nonoccluded condition was higher than that when circulation was occluded. A Tukey w revealed that when holding times were averaged across the blood flow levels all differences among the tension levels were significant with endurance times improving as level of tension was reduced. An analysis of the simple effects of occlusion across the four levels of tension revealed that the effect at the 35 percent MVC was significantly greater than at all other levels. An analysis of the relationship between strength and relative endurance yielded correlation coefficients which tended to be largely negative and nonsignificant. The range was from .11 to -.48, and there was no discernible effect on the magnitude of the correlation as the tension level was altered.

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**March 16, 1979**
**4:45 pm**

**ISOMETRIC PLANTAR FLEXION STRENGTH FATIGUE PATTERNS IN POWER AND ENDURANCE TRAINED SUBJECTS.** Walter Kroll, Sheryl T. Zigon, Priscilla M. Clarkson, University of Massachusetts, Amherst.

Isometric strength fatigue patterns induced by serial contractions were studied in eight male strength trained power athletes and nine male endurance trained distance runners. Fatigue regimens of 25 trials with intertrial rest periods of 5- or 20-secs were used to elicit different fatigue levels. Trials consisted of 10-sec maximum isometric contractions of the right ankle extensor muscle group. Independently established baseline strength was not significantly higher than Trial 1 strength on either of the two exercise days. Actual Trial 1 strength, however, was consistently less than baseline strength. Power subjects showed smaller differences between baseline and Trial 1 strength (differences of -2.5% and -5.6%) than endurance subjects (differences of -8.5% and -11.5%). Endurance subjects (X=127 kg) were significantly weaker than power subjects (X=192 kg). For the 5-sec rest condition, power subjects fatigued 39% while endurance subjects fatigued 31%. Power subjects demonstrated significant linear, quadratic, and cubic trend components in the fatigue curve while endurance subjects exhibited only a linear trend. For the 20-sec rest condition, power subjects fatigued 15% with significant linear and quadratic trend components while endurance subjects had a nonsignificant strength loss around 5%. Significant between group differences on linear, quadratic, and cubic trend components resulted for both rest conditions. Results are in agreement with previous studies which have reported significant differences in isometric wrist flexion strength fatigue curves between different levels of strength for both males and females. Power trained subjects exhibited more complex fatigue patterns in terms of statistically significant trend components and greater absolute and relative strength decrements than endurance subjects. It is not known whether the dissimilar fatigue patterns found in power and endurance trained subjects are due to differences in maximum strength, muscle mass, blood flow, energy source utilization, or muscle fiber type composition.

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March 16, 1979
5:00 pm

POWER OUTPUT IN THE INTACT HUMAN MUSCLE. John Clayton, Texas Christian University

The purpose of the present study was to determine power output in the intact human muscle when loaded at 3 different percentages(30,60,90) of the maximal voluntary dynamic contraction strength(1RM), and furthermore, to ascertain if 2 distinct routines of weight training had differential effects on power output, strength, and endurance. Thirty-two male university students were assigned to one of 2 groups, one training at 80% of their 1RM on the bench press and the other group training at 50%. Displacement curves were obtained by a mechanical apparatus which connected the bench press station on a Universal Gym via a potentiometer to a Honeywell chart recorder. Power output was determined from the displacement curves. Strength was evaluated by having each S perform a 1RM on the bench press, while endurance was evaluated by calculating the total amount of work each S could perform at 50% of his 1RM. It was clearly demonstrated in both the pre- and post-test situations that the most power could be generated at a loading of 60% of the Ss 1RM($p < .001$). Ss failed to show any statistically significant improvement in strength, endurance, or power, and there was no significant difference between groups on these parameters. Although the results were not statistically significant, the findings indicate that training at a load of 50% of one's 1RM may be just as efficient in evoking changes in power, strength, and endurance as training at a resistance of 80% of the 1RM. The 60% loading which yielded optimum power may be an indication of an intrinsic quality of muscular function and/or may be strongly influenced by the length-tension curves of the muscle groups participating in the motion.

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March 16, 1979
5:15 pm

# HEALTH AND FITNESS AND THE QUALITY OF LIFE AMONG GOVERNMENT EMPLOYEES.

Lee Vander Velden, University of Maryland and Mary McElroy, Kansas State University.

Designed to compare health and physical fitness with perceived quality of life, this research was an attempt to examine the importance of health and fitness for happiness and satisfaction with life in America. One hundred forty-four males and forty-seven female participants in the United States Department of Justice Physical Fitness Program answered a series of questions on the quality of their lives in the Washington Metropolitan Area. They reported their likes and dislikes about their homes, cities, neighborhoods, jobs, non-work activities, etc. Self reports of health status and happiness and composite indices of overall life and job satisfaction and body image were related to a number of anthropometric and physiological measures of health and fitness. Maximum oxygen uptake (VO·2), number of situps and per cent body fat were chosen as the fitness criteria. All data were obtained prior to a fitness training period. Generally those physically fit feel more healthy and are more satisfied with the physical work and exercise in their lives. Physically fit males (VO·2) and females (situps) have more positive attitudes toward their bodies. Moreover, those with a more positive body image feel more healthy and are more likely to be satisfied with their lives. Such findings were expected. However, the additional finding that those with the most and the least satisfaction with American life were less fit than those with medium satisfaction, a result found for both oxygen uptake and situps, is more difficult to explain. Several alternative explanations were presented to account for the inverted "U-shaped" relationship between satisfaction and fitness.

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March 17, 1979
9:00 am

EXPECTANCY DIFFERENCES BETWEEN MALES AND FEMALES IN THE PERFORMANCE OF PRESELECTED AND CONSTRAINED MOVEMENTS.
Richard F. Gerson, Florida State University.

Performance differences and differences in expectancies of success between men and women were examined relative to the replication of preselected and constrained movements. No performance differences were found between the sexes, but preselected movements were reproduced more accurately than constrained movements. Persons who made preselected movements also expected to replicate those movements better than their constrained counterparts while males evidenced higher expectancies than females with respect to the replication movement. However, no differences were found in ratings of future expectancies after the subjects were informed that the reproduction accuracy of their initial performances was similar. The results were discussed in terms of a cognitive interpretation of the preselection effect, and the cultural stereotype of women in achievement settings, as well as how the acknowledgement of a good female performance can lead women to elevate their future expectancies of success.

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**March 17, 1979**
**9:15 am**

**PLAY, GAMES, AND SPORT: DEVELOPMENTAL IMPLICATIONS FOR YOUNG PEOPLE.** Jay J. Coakley, University of Colorado, Colorado Springs.

The participation of youngsters in organized sport programs has increased dramatically over the past two decades. Until recently, few people questioned this trend; it has usually been assumed that participation in sport is wholesome and conducive to normal child development. But during the past few years organized sports have come under attack. Critics accuse them of being overly competitive, work-oriented, funless programs leading participants to become anxiety-ridden failures or cynical sport specialists. Proponents of the programs have responded with equally extreme statements about the positive consequences of participation. This paper is an attempt to move beyond the rhetoric about youth sports. An understanding of what happens to kids during their participation in different types of sport activities requires an awareness of (1) the characteristics of the social contexts in which the activities occur and (2) the meanings that the kids themselves assign to their experiences. The paper presents a brief review of the structural differences between play, games, and sport and reports data collected on the subjective experiences of young participants (less than 13 years old) in each of these activity contexts. Data were gathered through a combination of semi-structured interviews and observations of participants in organized youth sport programs (football, soccer, baseball, and softball), informally organized games (variety of types), and spontaneous play activities. The findings clearly suggest that the patterns of experiences vary according to the context in which they occur. The motives for participation, the dynamics of the activities, the meanings assigned to experiences, and the implications of the subjective experiences are different for each of the settings. It is concluded that spontaneous play is an emergent, expressive, and structurally unstable activity sustained through role playing, interpersonal exchange processes, and immediate positive reinforcement. Games are activities dependent on abilities to manage competitive interpersonal relationships and they provide experiences with a combined emphasis on expression, personal involvement, and controlled uncertainty. Organized sport is a structurally stable activity providing experiences focusing on role learning, performance, and outcomes. Each activity offers a unique and necessary, but incomplete, set of developmental experiences.

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March 17, 1979
9:30 am

## GROUP COHESIVENESS AND TEAM SUCCESS AMONG WOMEN'S INTERCOLLEGIATE BASKETBALL TEAMS. Linda Cotter, Cabrillo College

The problem of the study was to investigate the influence of cohesiveness on the team success of women's intercollegiate basketball teams. The Sport Cohesiveness Questionnaire, a measure of group cohesiveness was administered previous to and following the season to 138 members of the women's basketball teams from two college conferences in Northern California. Success was determined by percentage of games won. The data were analyzed by stepwise multiple linear regression analysis, discriminant function analysis and analysis of variance. The .05 level of significance was used for all tests. The cohesiveness variables Closely Knit and Power, the satisfaction variable, Satisfaction General, and the motivation variables Task Orientation and Affiliation Orientation were significant predictors of success. The variables Power, Closely Knit, and Enjoy Playing with Others were significant in discriminating between success groups. Scholarship schools differed from non-scholarship schools by scoring significantly higher on Self Orientation and significantly lower on Affiliation Orientation. Successful and unsuccessful teams did not differ on preseason to postseason cohesiveness changes. The following conclusions were made: Several of the variables can be used to predict success and discriminate between successful and unsuccessful groups. Scholarship women basketball players differ from non-scholarship women basketball players only by scoring higher on Self Orientation and lower on Affiliation Orientation. Seasonal changes in cohesiveness do not affect success. Further administrations of the Sport Cohesiveness Questionnaire are recommended using samples of male and female athletes of various skill levels and sports to determine which variables demonstrate consistent significance. Further administrations of the Sport Cohesiveness Questionnaire are recommended using samples of male and female athletes of various skill levels and sports to determine which variables demonstrate consistent significance.

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**March 17, 1979**
**9:45 am**

**ATHLETIC DELIQUENCY: A PRELIMINARY ANALYSIS.** Jeffrey O. Segrave, Skidmore College.

The purpose of this study was to further investigate the relationship between juvenile delinquency and participation in athletics. More specifically, the study attempted to take a preliminary look at the nature of what has been referred to by sport sociologists as 'athletic delinquency'. Although previous studies have supported the negative association between athletic participation and juvenile delinquency, little research of an empirical type has been directed towards the nature of the delinquency in which athletes are likely to be involved. Self-report questionnaires were administered to 179 male students from three selected state schools. The questionnaires obtained selected background characteristics of the sample including age, participation in athletics, self-reported acts of juvenile delinquency, and attitudes towards the seriousness of specific offenses. For the purpose of statistical analysis the Chi-square test was used ($p < .01$). The results indicated that the over-all relationship between athletic participation and juvenile delinquency was a fuction of the degree of athletic involvement and the type of offense. Higher rates of delinquency were found among athletes who reported a high degree of involvement in athletic programs than among athletes who indicated a low level of participation. However, rates of delinquency among the present sample of athletes decreased when the level of offense was classified as more serious. In other words, it was found that the less serious the offense, the greater the involvement of athletes in delinquent behavior. 'Athletic delinquency' among the present sample was based more on minor offenses (e.g. drunkenness, neighbourhood disturbances, minor drug charges) - behavior which is more likely to be immediately visible to society in general - than on offenses categorized as more serious (e.g. stealing, assault, breaking and entering). In conclusion, the present evidence suggests that the phenomenon of 'athletic delinquency' may not in fact be seriously anti-social.

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March 17, 1979
10:00 am

# THE HOME COURT ADVANTAGE: A SOCIAL FACILITATION INTERPRETATION.

Philip E. Varca, University of Georgia.

This study examined how playing at home and on the road affected the performance of college basketball teams. Also, this research formulated a general model for interpreting the "home court advantage." The design counterbalanced the team variable by examining SEC teams only. During the 1978 season, the ten SEC teams played each other twice-once on each team's court. Thus, there were 90 SEC games with the home team winning 63 of them. Team performance for these games was divided in half. One half represented home play and the other half represented road play. Each team played nine games at home and nine games on the road against the same opponents in each condition. Therefore, this design focused on teams of varying ability while equating ability between home and away teams. Data were taken from SEC box-scores. There was no significant difference between home and away performance with respect to field goal percentage (FG%) or free throw percentage (FT%). The FG% and FT% was 49% and 70% for home teams and 48% and 68% for visiting teams. Also, the dependent variables, fouls and turnovers, yielded no significant differences. There was a significant difference between home and away performance for rebounding, $F(1, 160) = 10.08$, $p < .01$, and steals, $F(1, 160) = 6.26$, $p < .01$. Home teams averaged three more rebounds and stole the ball 1.2 more times than their opponents. There is no evidence of differences between home and away team play with respect to highly skilled (i.e.:FG%, FT%) or highly practiced (i.e.: turnovers) behaviors. Rather, home teams appear to differ with respect to reactive behaviors (i.e.:steals, rebounds). Moreover, these behaviors are aggressive risk taking ones. Thus, it seems that home teams win more often due to aggressive defensive play. These results lead to a social facilitation and territoriality interpretation of the "home court advantage."

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March 17, 1979
10:15 am

## PHYSIOLOGICAL PROFILE OF A 70 YEAR OLD MARATHON RUNNER.

P.Maud, M.Akhtar, M.Al-Nouri, J.Anholm, C.Foster, G.Guten, C.Hellman, M.Pollock, and D.Schmidt, University of Wisconsin - Mount Sinai Medical Center, Milwaukee, Wisconsin

A 70 year old South African long distance runner, holder of his age group marathon record (3:06:24), was studied to determine the effects of 52 years of regular training on functional capacity and health. Maximal treadmill exercise testing revealed no ischemic ECG abnormalities and an excellent functional capacity (51.5 ml/kg. min). Submaximal testing showed that 85% of maximum aerobic capacity was required to complete the marathon in his record time. Hydrostatic weighing indicated that the subject was very lean (13.6% fat) for his age. Muscle fiber composition (gastrocnemius) was 82% slow twitch, a finding in keeping with this individual's lifelong success at marathon and ultramarathon events (1952 Olympic Marathon = 10th place, 5 time winner of Comrades 54 mile marathon). Pulmonary function and blood chemistry were within normal limits. Although total cholesterol was somewhat high (247 mg%), HDL cholesterol was markedly elevated (70 mg%). Twenty-four hour holter monitoring revealed no significant ventricular ectopic activity although frequent premature atrial contractions were noted. Left ventricular anatomy and function as evaluated by M-mode echocardiography and $Tc^{99m}$ radionuclide cineangiography revealed values for end diastolic volume (157 and 115 ml respectively), ejection fraction (0.79 and 0.69 respectively), and left ventricular wall thickness to be comparable with those found in other elite distance runners. Orthopedic status evaluated by physical examination and radiographic studies revealed no significant abnormalities together with excellent flexibility and well balanced muscular strength. Thickened heel pads were also noted. The results of these studies would appear to be indicative of the beneficial effects of habitual physical activity upon the retention of functional capacity and health with aging.

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**March 17, 1979**
**9:00-11:00 am**
**Poster #1**

## PHYSIOLOGICAL RESPONSES DURING COMPETITIVE MARATHON RUNNING.

Carl Foster, University of Wisconsin-Mount Sinai Medical Center, and Jack T. Daniels, University of Texas at Austin

The physiological responses of an experienced marathon runner were studied in the laboratory and during two marathon races requiring times of 3:14 (A) and 2:58 (B) respectively. On the basis of laboratory studies, running at the average pace required for these races would require 65.9% (A) and 72.5% (B) of the subjects $VO_2$ max (61.5 ml/kgx min $^{-1}$). Measurement of oxygen uptake at 5 mile intervals during each race revealed that the aerobic demands of running under competitive conditions significantly exceed estimates based on laboratory studies. During race A the measured $\dot{V}O_2$ ranged from 41.8 to 43.8 ml/kg x min $^{-1}$) and represented 68.0 to 79.3% of the subjects laboratory $\dot{V}O_2$ max. During race B $\dot{V}O_2$ ranged from 45.8 to 52.0 ml/kg x min $^{-1}$ and represented 74.5 to 84.6% of $\dot{V}O_2$ max. During 9 of 10 measurements $\dot{V}O_2$ during the races was higher than would have been predicted for that momentary running speed on the basis of laboratory studies. The results indicate that the actual physiological requirements of competitive running may be considerably underestimated by laboratory studies. On the basis of these data, it is suggested that previous estimates of the relative effort expended by elite marathon runners (70-85% $VO_2$ max) may, in fact, be rather conservative.

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**March 17, 1979**
**9:00-11:00 am**
**Poster #2**

# COMPARISON OF THE PHYSIOLOGICAL CHARACTERISTICS OF NATIONAL CLASS MIDDLE AND LONG DISTANCE RUNNERS.

R.A. Boileau, W.F. Riner, J.L. Mayhew, and G.R. Wieneke, Physical Fitness Research Laboratory, Department of Physical Education, University of Illinois at Urbana-Champaign.

The purpose of this investigation was to evaluate the physiological characteristics of forty-eight national class distance runners. A secondary focus was to compare the characteristics of runners who compete primarily in middle distance events with those who compete primarily in long distance events. The subjects were participants in a development clinic sponsored by the U.S. Olympic Committee and were selected from across the U.S.A. on the basis of previous performance records and future potential. Maximal and submaximal physiological responses were assessed during speed and grade incremented treadmill running. Additionally, body density was measured by hydrostatic weighing allowing estimation of body fat. For the purpose of data analysis, the runners were classified into two groups according to their primary events: middle distance (MD), N = 24, 800m and 1500 m run; and long distance (LD), N = 24, 3,000 m steeplechase, 5,000 m and 10,000 m run. Selected data for the MD and LD groups, respectively, were as follows: age (yr), 21.9 ± 3.0, 22.2 ± 2.5; ht (cm), 181.0 ± 5.9, 178.5 ± 5.9; wt (kg), 67.3 ± 6.0, 64.2 ± 5.1; % Fat, 9.5 ± 2.9, 10.1 ± 2.2. The $VO_2$ max (ml/kgBW · min) of the LD group was significantly higher than the MD group (75.8 ± 5.0 vs 66.2 ± 5.0) confirming the greater aerobic power requirements of LD events. Maximal heart rate was similar for both groups (196.2 ± 8.1 MD group 194.1 ± 8.3 LD group). A comparative analysis of the running "efficiency" was also conducted based on the oxygen consumption at various running speeds. The data suggests that there are specific physiological requirements necessary for exceptional performance in endurance running. Furthermore, there appears to be several significantly different physiological characteristics required for middle distance and long distance running events as classified in this study.

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March 17, 1979
9:00-11:00 am
Poster #3

## PHYSIOLOGICAL PROFILES OF HIGH SCHOOL FEMALE CROSS COUNTRY RUNNERS.

**N. K. Butts, University of Wisconsin-La Crosse***

The purpose of this investigation was to evaluate selected physiological characteristics of 22 high school girls (X=15.3 yr) who had been running competitively for an average of 2.2 years and were averaging 25 miles per week at the time of testing (summer). The average best 2-mile competitive time for the group was 12:12. After a 5 minute warm-up run each subject performed a continuous uphill treadmill run with the elevation increasing 2½% every 3 minutes until exhaustion and/or when oxygen consumption no longer increased. All physiological measures were determined every minute throughout the run and ratings of perceived exertion (RPE) on the Borg scale were obtained for every workload. Body composition was evaluated by the hydrostatic weighing technique with residual volumes calculated by the nitrogen procedure. The mean relative body fat was 16.3% which is considerably lower than the average high school aged girl's, however, it is comparable to that reported for older female distance runners. Although the mean value for $\dot{V}_{O_2}$ max (52.3 ml/kg/min) was considerably higher than that reported for the average female it is typical of that reported for the trained, teenage female athlete. The average maximal heart rate was 196.5 bpm and is similar to values found for this age group. When absolute maximal oxygen values (L/min) were correlated with the individual's best competitive 2-mile run and the 3,000 meter run conducted for this study, r's of .51 were obtained for both runs. When the relative maximal values (ml/kg/min) were correlated with these same runs slightly higher r's of .61 and .66 respectively, were calculated. Although the RPE scale ranges from a low of 6 to a high of 20, no subject indicated the maximal value when they terminated the run despite the fact that they could no longer continue.

*This project was supported through a grant from the University of Wisconsin-La Crosse Research Committee.

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**March 17, 1979**
**9:00-11:00 am**
**Poster #4**

# VENOUS BLOOD LACTATE APPEARANCE AND DISAPPEARANCE FOLLOWING SUPRAMAXIMAL EXERCISE.

Robert J Moffatt, Stanley P Sady, University of Michigan; Bryant A Stamford, University of Louisville; Victor L Katch, University of Michigan; Arthur Weltman, University of Louisville.

The purpose of this study was to investigate the appearance (min 0-5) and disappearance (min 6-40) of venous blood lactate during active versus passive recovery from supramaximal exercise (SME). SME consisted of 40 seconds of all-out pedalling on a Monark bicycle ergometer at 5.5 kg. Post-SME recovery patterns included active below anaerobic threshold (<AT) beginning immediately following SME, active below anaerobic threshold beginning after 10 minutes (<AT-10) and 20 minutes (<AT-20) of passive recovery, active above anaerobic threshold (>AT) beginning immediately following SME and passive recovery. Anaerobic threshold was determined from the blood lactate concentration-work rate relationship observed from an incremental continuous $VO_2$max test. Blood samples were obtained from an antecubital vein at 0,1,2,3,4,5,7,10,15,20,30 and 40 minutes post-SME. Comparison of total pedal revolutions revealed no significant differences among the 5 SME tests. Peak venous blood lactate was the same across treatments and peaked at minute 5 for all treatments except >AT which peaked at minute 3. Recovery patterns <AT and >AT demonstrated the greatest lactate disappearance. It was concluded that lactate disappearance is not related to appearance nor does active versus passive recovery influence lactate appearance. Recovery from one legged (right) SME at 2.5 kg was also examined. No differences in lactate appearance or disappearance were found among active recovery with the right versus left leg and passive recovery. It was concluded that active recovery with a fatigued muscle mass does not differ from a non-fatigued muscle mass with respect to lactate appearance and/or disappearance.

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March 17, 1979
9:00-11:00 am
Poster #5

## GLYCOGEN DEPLETION IN LIVER AND THREE FIBER TYPES WITH RAPIDLY EXHAUSTIVE EXERCISE.

**Desmond R. Parrish, Steve Morris, Hugh W. Bonner; Department of Health, Physical Education and Recreation; University of Texas at Austin.**

To determine the effects of rapidly exhaustive exercise upon the glycogen depletion patterns in the liver and three different muscle fiber types, female Wistar-strain rats were run to exhaustion on a motor driven treadmill. The speed progressively increased each minute from 21.5 m/min. to 53.5 m/min. After the animals attained the maximal speed, the incline of the treadmill was raised 2.5%/min. to a maximal grade of 12.5%. Animals were judged to be exhausted when they were unable to right themselves when placed on their back. The mean time to exhaustion was 16.7 minutes, which is of sufficient duration to insure that neither immediate energy sources (ATP/CP) nor oxidative metabolism were the predominant energy sources. Blood lactate levels using this protocol on another group ranged from 90-140mg.%. Tissue samples were taken from the liver, soleus, superficial and intermediate portions of the Rectus Femoris. These muscles represent slow-twitch oxidative (SO), fast-twitch glycolytic (FG), and fast-twitch oxidative - glycolytic (FOG) fibers, respectively. The tissues were frozen in liquid nitrogen; the protein was digested in boiling KOH; the glycogen was extracted using ethanol, and its concentration was measured spectrophotometrically against glycogen standards which were purified using an amberlite column. After exhaustion the glycogen levels fell 65% in the liver, 78% in the SO fibers, 75% in the FOG fibers and 81% in FG fibers ($P<0.01$). Unlike reports of steady-state exercise lasting two hours where only the SO and FOG fibers exhibited glycogen depletion (approximately 50%), this type of exercise exhausted the glycogen in all fibers indicating the massive recruitment of all muscle fiber types. Furthermore, the depletion of liver glycogen which will result in hypoglycemia is also rapid and quite substantial. This mode of exercise is an excellent protocol for rapidly exhausting experimental animals.

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**March 17, 1979**
**9:00-11:00 am**
**Poster #6**

**ALTERATIONS IN MITOCHONDRIAL SIZE AND CYTOCHROME CONTENT IN RESPONSE TO ENDURANCE TRAINING.** Roger P. Farrar and Loren R. Mayer, University of Texas; Joseph W. Starnes and Dee W. Edington, University of Michigan.

Increases in oxidative capacity of skeletal muscle which has undergone endurance training is well documented. The concomitant shifts in mitochondrial size and cytochrome content have varied with different investigations. This study was undertaken to look at the shifts in mitochondrial size and cytochrome content in order to better understand the process of adaptation in response to aerobic stress. Groups of adult male rats were run for 4, 8, or 16 weeks. The duration of the runs progressed until the twelfth week, at which point they were running 30 m./min. for 120 min./ day. This level was maintained until the sixteenth week. The quadriceps muscles, except for the vastus intermedius, were excised and the tissue homogenized to obtain the mitochondria. Two sizes of mitochondria were obtained through differential centrifugation. The protein and cytochrome concentrations were measured spectrophotometrically. Mitochondrial protein increased progressively per gram of tissue with training. The major portion of the increase in mitochondrial protein concentration in the fourth and eighth weeks occurred in the small mitochondrial fraction. From the eighth to the sixteenth week there was an increase in the large mitochondrial fraction, accounting for almost all of the increase in mitochondrial protein. Cytochromes $c+c_1$ and b, when expressed per gram of tissue, peaked after 8 weeks of training, while cytochrome $aa_3$ was in the greatest concentration after 16 weeks. When the cytochrome concentrations are expressed per mg. of mitochondrial protein, cytochromes $aa_3$ and b were in the greatest concentration in the small mitochondria, while $c+c_1$ was in the greatest concentration in the large mitochondria. With training the cytochromes showed differing rate of increase. In evaluating training regime effects on skeletal muscle it appears important to take into consideration the shifts in size and cytochrome content of mitochondria.

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March 17, 1979
9:00-11:00 am
Poster #7

# EFFECTS OF EXERCISE TRAINING ON CALCIUM UPTAKE IN CARDIAC MITOCHONDRIA.

Linda Keller, Roger P. Farrar, Steven W. Leslie, Susan L. Hudman, Hugh H. Bonner; The University of Texas at Austin.

Female rats, 6 weeks of age, were subjected to an exercise training program consisting of running 5 days/week at 32 m/min up an 8% grade for $1\frac{1}{2}$ hours. This training regime was maintained for 18 months. When compared to non-trained animals, body weights, heart weights, and mitochondrial protein yields were not different. Heart weight to body weight ratios were 15.13% greater in trained animals ($p < .001$). _In vitro_ mitochondrial $^{45}$calcium non-specific binding and uptake in cardiac tissue were studied using the Millipore filtration method. Energy independent $^{45}$calcium non-specific binding in cardiac mitochondria from trained animals at rest was not different from that of non-trained animals at rest. Adenosine-triphosphate supported $^{45}$calcium uptake in cardiac mitochondria from trained animals at rest was 50% greater than that from non-trained animals at rest ($p < .001$). It was concluded that low values of $^{45}$calcium uptake in mitochondria from non-trained animals was a reflection of decreased metabolic activity brought about by aging. The average lifespan of a laboratory-raised rat is approximately 25 months, and metabolic decreases in mitochondria have been found to occur with increases in age. Exercise appears to offset the effects of aging by maintaining mitochondrial capacity to accumulate $^{45}$calcium.

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**March 17, 1979**
**9:00-11:00 am**
**Poster #8**

# METABOLIC, CARDIOVASCULAR, AND ADRENAL RESPONSE OF RUNNERS AND SWIMMERS EXERCISING IN 20, 25, 30, and 35°C WATER.

Robert G. McMurray, University of North Carolina; Daniel Miles, University of California, Santa Barbara; Steven M. Horvath, University of California, Santa Barbara.

Evaluation of trained swimmers and runners have indicated that runners demonstrate greater improvements in metabolic and cardiorespiratory parameters. Since the comparisons have been only reported in an air environment, the question still exists as to whether the improved efficiency of the runners would still exist if the comparisons were made in a water environment. To this end, the metabolic, cardiovascular, respiratory, and adrenal responses were compared in 5 trained distance runners and 6 trained swimmers while exercising at 60% $VO_2$ max for 30 min in 20, 25, 30, and 35°C water. $V_E$, $VO_2$, cardiac output and cardiac index were similar for both groups and independent of water temperature. Changes in heart rate were directly related to water temperature. The swimmers were unable to maintain stroke index throughout the duration of exercise in warmer water while the runner, once establishing a stroke index, maintained it. This would be constant with the enhanced circulatory control of the runners derived from rigorous training and possible heat acclimatization. It may also indicate a lack of heat tolerance with the swimmers. The consistantly higher stroke index in the runners during all trials would tend to favor a more fit cardiovascular system in the runners. No significant differences in urinary catacholamines and dopamine excretion or plasma corticol occurred when comparing swimmers and runners or water temperature exposures. In general, it can be said that subtle differences in the cardiovascular response exists between swimmers and runners and the response was related to the duration of exercise and water temperature. It may also be suggested that runners were not superior to swimmers when tested in a water environment.

This work was supported by the National Institutes of Health under grant NIH AG00021.

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March 17, 1979
9:00-11:00 am
Poster #9

**A COMPARISON OF FAT METABOLISM BETWEEN TRAINED MEN AND WOMEN DURING PROLONGED AEROBIC WORK.** Scotty K. Powers, Edward Howley, William Riley, University of Tennessee, Knoxville.

The purpose of this study was to determine if sex differences in fat metabolism existed between trained men and women during prolonged aerobic work. Four pairs of subjects were matched according to $\dot{V}O_2$ max ml/kg.min and the amount of endurance running engaged in over the six-week period prior to testing. All subjects ran at 65 percent of their maximal aerobic power for 90 minutes on a treadmill. Blood samples were taken before and after the test to be analyzed for lactate. Heart rate was measured throughout the test. Ventilatory and gas exchange measurements were taken every eight minutes during the exercise period and the values were used to compute the respiratory exchange ratio (R). This steady state non-protein R was used to determine the total contribution of fat as a substrate to exercise metabolism. A two way Anova for repeated measures revealed no significant difference ($P > 0.20$) in fat metabolism between the men and women. Both men and women did, however, show a significant increase ($P < 0.001$) in the rate of fat metabolism as the exercise session progressed. No significant differences ($P < 0.05$) were noted in the lactate concentrate between the groups. These findings are in agreement with previous research that fat metabolism increases over time in aerobic work. These data further suggest that when matched according to maximum $\dot{V}O_2$ ml/kg.min and total training, no differences exist between sexes in the rate of fat metabolism during prolonged aerobic work of low intensity.

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March 17, 1979
9:00-11:00 am
Poster #10

**METABOLIC AND HORMONAL RESPONSES TO 60% $O_2$ DURING PROLONGED STEADY RATE WORK. Edward Howley, Ronald Cox, Hugh Welch, and Richard Adams, The University of Tennessee, Knoxville.**

The purpose of these pilot experiments was to determine the effect of breathing 60% $O_2$, compared to air, on the concentrations of plasma epinephrine (E), norepinephrine (NE), lactic acid, and free fatty acid during prolonged steady rate exercise. Two subjects worked continuously at 65% $VO_2$ max on a Monark bicycle ergometer for 60 min on each of two occasions. On one occasion, the subject breathed air (20.93% $O_2$) for the first 30 min of the test and 60% $O_2$ for the second 30 min. The treatment order was reversed on the other occasion. The test order was randomly selected and the subjects were unaware of the order of the treatments. Venous blood samples were obtained from an indwelling catheter before work and at the end of each 10-minute period during work. For the air to 60% $O_2$ treatment, the plasma NE concentration increased from 230 pg/ml before exercise to 1640 pg/ml at the end of exercise; E increased from 60 pg/ml to 310 pg/ml. During the 60% $O_2$ to air treatment, NE increased from 300 pg/ml to 1550 pg/ml and E increased from 130 pg/ml to 520 pg/ml. NE increased over time independent of treatment and there was no effect of the switch in inspired $O_2$ on the plasma NE level. The E level was relatively steady from 20 to 40 min of exercise, showing the lack of effect of the switch (at 30 minutes) in gas mixtures. The E level increased in the last 20 min of the test. The lactic acid level decreased for both treatments from 30 to 40 min into the work bout indicating that the switch in the gas mixture was not responsible for the drop. However, the lactic acid level reached 6.9mM during the air to 60% $O_2$ treatment compared to 4.6mM during the 60% $O_2$ to air treatment. The use of the 60% $O_2$ treatment at the start of work may have slowed the rate of glycolysis early in work resulting in the lower lactate level. There was no apparent effect of the 60% $O_2$ treatment on the plasma FFA response to work. The plasma FFA level increased from 10 min through the 60 min of work, independent of treatment. It is apparent that 60% $O_2$ had little or no effect on the heart rate or metabolic response to exercise in this study. Further, heart rate was shown to change only slightly from 30 to 60 min work, while the NE and E levels increased 40% and 90%, respectively.

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**March 17, 1979**
**9:00-11:00 am**
**Poster #11**

# PHYSIOLOGICAL RESPONSES TO EXERCISE IN A DESERT ENVIRONMENT.

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The purpose of this investigation was to observe differences in physiological responses to work in a desert environment among human subjects representing varying levels of acclimatization and physical fitness. Three groups of subjects were selected: (1) unacclimatized males (UM) n = 6, (2) acclimatized males (AM) n = 6, and (3) acclimatized fit males (AFM) n = 3. UM were recent arrivals in Arizona who were long time residents of cooler climates. AM were residents of Phoenix for more than 5 years. AFM were residents who participated in long-distance running during the summer months. Each subject sat for 40 minutes and then walked for 40 minutes at 3.5 mph at a grade representative of his individually determined 50% $\dot{V}O_2$ max. This procedure was performed in a thermally neutral indoor environment (WBGT = 65F) and in an outdoor desert (hot, dry and sunny) environment (WBGT = 85F). The order of the experiments was randomized. Rectal temperatures ($T_{re}$) obtained via indwelling thermistor probe, and heart rates (HR) obtained via modified V-4 ECG lead, were recorded every 5 minutes. Oxygen uptake ($\dot{V}O_2$) was obtained every 20 minutes throughout the 80 minute exposure. Evaporative weight loss was determined by differences in body weight obtained every 40 minutes on a Homs balance beam scale (to the nearest 0.050 kg). Male newcomers (UM) to the hot-dry environment experienced consistently higher HR during both rest and work in the heat than did the residents. Final.mean HR's for the UM = 176, compared to 157 for the AM and 141 for the AFM. The AFM ($\dot{V}O_2$ max = 65.8 $ml\cdot kg^{-1}\cdot min^{-1}$) exhibited lower HR's than either AM or UM during both neutral and hot exposures despite a higher work load. Both groups of acclimatized subjects possessed lower $T_{re}$'s than the unacclimatized subjects. Especially interesting was the equal final $T_{re}$'s of the AM and the AFM despite the significantly higher heat production rates ($\dot{V}O_2$) of the AFM group. This indicated absence of a Q-10 effect. Apparently, the superior fitness of the AFM group gave them an added advantage in terms of adjustment to severe heat stress. Both the AM and the AFM exhibited higher levels of evaporative weight loss than the unacclimatized subjects. Conclusions were as follows: (1) acclimatization greatly reduces physiological strain experienced upon exposure to an outdoor hot-dry environment, and (2) a high level of physical training as indicated by $\dot{V}O_2$ max is an important variable in the ability to tolerate environment heat stress.

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March 17, 1979
9:00-11:00 am
Poster #12

## HUMAN CIRCADIAN RHYTHMS IN HEART RATE RESPONSE TO A MAXIMAL EXERCISE STRESS. Cheryl J. Cohen, Western Illinois University.

The within-day variability of physiological measures is mainly attributed to normal cyclic functions of the body, its circadian rhythms. A previous study (Cohen & Muehl, ERGONOMICS, 1977) concluded that both submaximal and recovery heart rates generally followed, and amplified, the circadian rhythmicity of resting heart rates in the same subjects. It was the purpose of this study, therefore, to determine whether maximum heart rate response to a work task possesses a similar pattern of circadian rhythmicity. Ten healthy males aged 18-24 years served as subjects. Their normal daily activities were not altered during the course of the study. All subjects were accustomed to the work task - a bicycle ergometer ride - before data were collected; all were endurance athletes, so selected to minimize any improvement in heart rate response to the work associated with repeated trials. Resting heart rates were recorded during one continuous 24 hour period, as follows: 0400, 0800, 1200, 1500, 1800 and 2400h. The starting time for resting heart rate measurement was randomly assigned to each subject. The exact procedure (including the time of the first measurement) was repeated one week later; mean heart rates for each time of day were then used in data analysis. The exercise task was imposed at the same seven times of day, with the starting time again randomly assigned to each subject. A minimum of 36 hours seperated each bout for each subject. Testing was completed during a one-month period of time. The work task consisted of a continuous progressive-load bicycle ergometer ride at a constant pedaling rate, designed to elicit exhaustion and termination in 4 to 8 minutes. During exercise, heart rate was recorded twice per minute. Results are as follows: (1)resting heart rates for these subjects exhibited similar circadian rhythmicity as those previous, with lowest rates at 0400 and highest at 1800 hours; and (2)maximum heart rate response to the imposed work task, however, did not exhibit a specific circadian rhythm pattern in these subjects, for the seven times of dat at which exercise was performed. Within the limitations of this study the following conclusions seem justified: whereas resting heart rate follows the previously-identified pattern of circadian rhythmicity, heart rate response to a maximal exercise stress exhibited no specific within-day variation that might indicate a pattern of circadian rhythmicity exists. This suggests that controlling time of day when imposing a maximal exercise stress may not be required.

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March 17, 1979
9:00-11:00 am
Poster #13

## EFFECTS OF REPEATED MAXIMAL EXERCISE ON MAXIMAL PERFORMANCE.

Bryant A. Stamford, Arthur Weltman, Richard Stremel, L. Bruce Gladden, Exercise Physiology Laboratory, University of Louisville, Louisville, KY 40208

Nine male subjects performed two ($T_1$; $T_2$) (separated by 20 min) 5 min maximal work tasks on a Monark bicycle ergometer. Work rate was not fixed but rather work-drop-off occurred through time thus permitting continuation of maximal performance. Total work-drop-off was 8.8% and 9.7%, respectively, for $T_1$ and $T_2$ with no significant difference between tests. Peak blood lactate concentration was 17.27 and 17.16 mM for $T_1$ and $T_2$,respectively. Pre-existing blood lactate concentration prior to $T_2$ was 11.33 mM and the $\Delta$ lactate values were 15.99 and 5.83 mM for $T_1$ and $T_2$, respectively. Total work output and min by min work output were the same for both tests. Maximal oxygen uptake ($\dot{V}O_2$max) was achieved during both tests as referenced against a preliminary discontinuous bicycle ergometer $\dot{V}O_2$max test. $\dot{V}O_2$max was achieved sooner and was sustained for a longer duration in $T_2$. Total oxygen consumption was significantly greater during $T_2$ when compared with $T_1$. R and $\dot{V}CO_2$ values were significantly greater during $T_1$ whereas ventilation (BTPS) values were similar for both tests. Since total and min by min work output were the same, it was suggested that energy expenditure was the same for both tests and therefore a greater anaerobic energy contribution was associated with $T_1$. It was concluded that severe prior exercise resulting in elevated pre-existing blood lactate concentration does not affect maximal aerobic power nor maximal performance on the type of work task employed in the present study.

Bryant A. Stamford, Exercise
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**March 17, 1979**
**9:00-11:00 am**
**Poster #14**

MAXIMAL EFFORT STATIC FORCE-TIME CURVES IN CHILDREN, 8-10 YEARS OF AGE. Scott Going, B.H. Massey and T.B. Hoshizaki, Physical Fitness Research Laboratory, Department of Physical Education, University of Illinois at Urbana-Champaign.

The consistency in pattern with which children 8 to 10 years of age generate maximal static force was assessed. The object was to ascertain which components of the force-time curve in addition to maximal force (strength), potentially could provide useful information regarding functional capacity of muscle. Thirty-two normal children, 15 girls and 17 boys, were subjects. Force-time curves for three muscle groups, hand flexors (HF), forearm flexors (FF) and forearm extensors (FE) were recorded three times consecutively for each muscle group on two test days one week apart, providing for each subject six force-time curves per muscle group. Subjects were positioned supine and instructed on each trial to exert force as "hard" and as "fast" as possible, giving a maximal effort. Force generated over time was recorded using a Daytronic Linear Voltage Differential Transformer (LVDT) with a Brush Clevite Mark 280 Analog recorder. Fourteen force, time, and combination force-time components of the curves were selected for measurement. The force patterns obtained were typically sigmoid. Force components, maximal force (strength), initial peak force, i.e., the point where the curve plateaued after rapid rise, and the maximal rate of force production were quite reproducible with re-test intraclass correlation coefficients as follows: maximum force (R = .86, HF; .92, FF; .83, FE), initial peak force (R = .82, HF; .88, FF; .82 FE), and maximal rate of force production (R = .84, HF; .85, FF; and .87 FE). The time to select percentages of maximal force were variable with coefficients ranging from .28 to .74. Maximal force achieved and initial peak force were highly correlated (r = .85, HF: .92, FF; .90 FE), while maximal rate of force production correlated moderately with initial peak force (r = .74, HF; .72, FF and .82 FE) and with maximal force (r = .68, HF; .68, FF; .69 FE). Maximal force, initial peak force and maximal rate of force production warrant further investigation in children.

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March 17, 1979
9:00-11:00 am
Poster #15

## MOTOR CREATIVITY OF PRESCHOOL DEAF CHILDREN.

ELLEN N. LUBIN, University of Arkansas at Little Rock.

The problem of this study was to investigate changes in the motor creativity of 24 preschool deaf children, three to five years old, after a four week experimental period of guided movement exploration on a novel piece of play apparatus, the London Trestle Tree Apparatus. Guided movement exploration based upon the use of the I CAN associated action words using total communication were used to facilitate creativity in movement experiences on the London Trestle Tree Apparatus. Data were collected on motor creativity using the Torrance Test of Thinking Creatively in Action and Movement and the Lubin Motor Creativity Testing Protocol (derived from the Sherrill-Rowe-Lubin adaptation of Wyrick's Motor Creativity Test). Children were videotaped before and after the four week experimental period in triads for a five minute period while they played freely on the London Trestle Tree Apparatus. On the same day, the children were exposed to the Torrance Test of Thinking Creatively in Action and Movement. Children were randomly assigned to triads, and then the triads were randomly assigned to experimental and control groups. The resulting videotapes were viewed by two raters who independently recorded the motor creativity data by marking the frequency of occurrence (motor fluency) and uniqueness of motor responses (motor originality) on preconstructed individual motor fluency and motor originality score sheets. High interrater objectivity and test-retest reliability measures were computed. Factorial analysis of covariance statistical procedures were used to tabulate the collected motor creativity data. On the basis of the findings, it can be concluded that preschool deaf children exposed to twenty days of guided movement exploration on the London Trestle Tree Apparatus will improve significantly over a control group in motor creativity as measured by the Torrance Test of Thinking Creatively in Action and Movement, but will show no significant increase over a control group in motor creativity as measured by the Lubin Motor Creativity Testing Protocol.

Ellen Lubin
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March 17, 1979
10:45 am

**BODY IMAGE OF MILDLY MENTALLY RETARDED CHILDREN: A FACTOR ANALYSIS.** Claudine Sherrill, Texas Woman's University; Muriel Hanson, TDMHMR Genetic Counseling Center, Denton; and Sherril York, Texas Woman's University.

The purpose of the research was to examine a hypothesized factor analytical structure of body image abilities among mentally retarded boys and girls, ages 8-10. The sample consisted of 88 mildly retarded children from 15 public schools in three large metropolitan areas in Texas. The hypothesized factor analytical structure was based upon a review of literature. Selected tests purporting to measure body image of mentally retarded persons which appeared in published research from 1926 to the present were administered to the subjects. Among these were tests by Head, Benton, Roach and Kephart, Berges and Lezine, Cratty, Staffieri, and Gottesman and Caldwell. Intercorrelations among 22 test scores, age, and sex were subjected to a principal axes factor analysis. The resulting 9 extracted factors were rotated by the Kaiser varimax criterion. Results showed that nine factors accounted for 70 percent of the total variance of the variables. Factors loading highest were finger localization and right-left discrimination; identification of body parts, surfaces, and sides; matching parents' body shapes to cards; and imitation of movements and praxis. It was concluded that physical education programming designed to enhance body-image should focus on activities directed toward the nine identified factors.

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March 17, 1979
11:00 am

### A COMPARATIVE ANALYSIS OF GAIT IN YOUNG TRAINABLE MENTALLY RETARDED AND NONRETARDED MALES.

Robert Alan Rider, University of North Carolina at Chapel Hill.

The purpose of this study was to determine if common characteristics existed in the gait patterns of a group of trainable mentally retarded males between the ages of 8 and 12 as compared with a group of nonretarded males of the same age. Each subject was filmed using a 16mm movie camera as they performed the gait movement. The film was processed and analyzed using the Vanguard Motion Analyzer. The parameters of stride length, stride rate, duration of stride, duration of swing, duration of stance, duration of double support and mean angular displacement were examined. The comparison of raw score means from both groups indicate a gait pattern that was consistently different in the retarded group as compared to the nonretarded subjects. Mean angular displacements of the knee, hip and ankle were compared between groups and the graphical representations of these measurements indicate greater velocity, extension and flexion occurring in the gait patterns of the nonretarded group. When stride lengths were examined, the retarded group displayed a mean stride that was significantly shorter than the mean stride for the nonretarded group. A comparison of stride rate showed that the retarded subjects walked at a much slower rate. An investigation of duration of stride, duration of stance and duration of double support resulted in a highly significant difference in the amount of time the retarded group remained in these various supportive phases of gait as compared with the nonretarded group, with the retarded group requiring the greater amount of time to complete each phase. Little difference occurred between groups for duration of swing. Based upon these results it has been concluded that there exists little similarity in the gait patterns of the trainable mentally retarded and nonretarded subjects employed in the study for the parameters that were investigated.

Dr. Robert Alan Rider
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March 17, 1979
11:15 am

## THE EFFECT OF A SIX WEEK TRAINING PROGRAM ON THE CARDIORESPIRATORY FITNESS LEVELS OF A SELECT GROUP OF TRAINABLE MENTALLY RETARDED STUDENTS. Roseann Lynch, University Of Colorado.

The purpose of the study was to test the effect of a six week training program on the cardiorespiratory fitness levels of trainable mentally retarded(TMR) students. The subjects were 28 male and female TMR students from a public school in Boulder, Colorado. The ages ranged from 14-20. The IQ scores ranged from 30-64 as measured by the Weschler Scale. Cardiorespiratory fitness levels were determined by the Astrand-Rhyming Bicycle Ergometer test to estimate maximum oxygen uptake. Students were initially placed by IQ into either a high functioning or a low functioning group (each with 14 subjects). These groups were then randomly divided into Treatment and Control so that the study had four groups, seven subjects in each. All subjects were pretested on the bicycle ergometer. For six weeks the high functioning and low functioning treatment groups participated in a fitness program of jogging and running exercises, three times a week, 30 minutes per session. The control groups did not jog. They participated in skill activities which did not emphasize running. All subjects were posttested on the bicycle ergometer. Results of an analysis of covariance revealed the following findings: 1) there was a significant difference between the treatment and control group scores on the posttest 2) there was no significant difference between the high functioning student and low functioning student scores on the posttest. Within the limitations of the study, it appears that a cardiorespiratory program can improve the maximum oxygen uptake of TMR students.

Roseann Lynch
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March 17, 1979
11:30 A.M.

## COMPARISON OF THE ATTITUDES OF PHYSICAL EDUCATION AND RECREATION MAJORS TOWARD THE DISABLED. Peter M. Aufsesser, San Diego State University.

The study was conducted to determine the social acceptability of disabled individuals as viewed by students majoring in physical education and recreation. In addition the study attempted to ascertain if physical education majors used different criteria than recreation majors in determining the acceptability of different disabling conditions. The subjects for this study were 76 recreation majors and 53 physical education majors at San Diego State University who were enrolled in upper division majors' classes within their respective disciplines. However, none of the classes surveyed were in the areas of adapted physical education or therapeutic recreation. The students were asked to complete a questionaire developed by Bogardus with ten disabling conditions being substituted for national origins. The ten conditions were Blind, Deaf, Mentally Retarded, Confined to a wheelchair, Cerebral Palsy, Emotionally Disturbed, Amputee, Stutterer, Harelip and Epilepsy. The questions included choosing a best friend and then a self-affliction from the disabilities listed using a ranking procedure. In addition the subjects were asked to check from a list of six criteria, which of these criteria (if any) they utilized in making judgments about each of the ten disabilities. On each question the subject was expected to use their own perception of that condition. All subjects answered the questionnaire voluntarily and all replies remained anonymous. No identifying name or number was used other than the basic demographic data which included age, sex, year in school, religion and ethnic background. The results of the study indicate no significant differences between the ways physical education and recreation majors view disabled individuals. In fact as evidenced by the results of the question on selecting a best friend and the question on selecting a self-affliction from the list of disabling conditions, both the physical education and recreation majors portrayed a similar profile of attitudes toward all ten of the disabling conditions. The study also indicated that both physical education and recreation majors utilized similar criteria in determining their acceptance of each of the ten conditions in the survey.

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March 17, 1979
11:45 am

**INFORMATION PROCESSING ABILITY OF THE CEREBRAL PALSIED INDIVIDUAL AS A FUNCTION OF INCREASING AGE.** Jeffrey C. McLellan, University of Georgia; John N. Drowatzky, University of Toledo.

This study compared spastic cerebral palsied and neurologically normal individuals, matched for ages six to thirty years, on ability to process visual information and initiate movement, evaluating the function of age on reaction time (RT). Each group had 25 subjects and was divided into five equal age categories, each spanning five years. Simple RT to a visual stimulus by lifting the finger from a depressed microswitch and an intelligence score were recorded for each subject. Mental ability, assessed with the Vocabulary and Similarities subtests of the WISC-R or WAIS, was shown not related to simple RT. Two-way ANOVA and trend analysis indicated that age trends for simple RT were parallel and quadratic in shape for both groups. The cerebral palsied subjects, age five to ten years, were slower than their neurologically normal peers, whereas after age ten no differences in RT were found between the groups. Results were interpreted to show that in spice of motor performance impairment, information processing ability in the spastic cerebral palsied is comparable to normal after age ten years as measured by simple RT.

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March 17, 1979
12:00

## A COMPARISON OF THE RESPONSE TIMES OF DOWN'S SYNDROME AND NORMAL CHILDREN. Ernest K. Lange, University of New Mexico

The purpose of this study was to determine the differences, if any, in reaction time (RT) and movement time (MT) of Down's Syndrome (DS) and normal children. Eight hypotheses were tested using analysis of variance for data interpretation. Twelve DS children and 20 normal children from a metropolitan area made 96 responses each to a simple RT task. A modest RT electronic device was utilized to measure performance in milliseconds on a digital counter. An interval timer was used to alter preparatory interval. RT and MT were compared between the experimental and control groups. Results indicated the acceptance of Hypotheses 1 through 6 and rejection of Hypotheses 7 and 8. The prediction that DS males would demonstrate faster RT and MT than DS females (Hypotheses 7 and 8) was not sustained. The literature supporting findings of DS and normal differences prevailed. Differences predicted by sex within the DS group were not upheld. Many times performance differences between groups are due primarily to lack of opportunity for experience by the subjects. It is anticipated that mainstream efforts in physical education for diverse populations will reduce the discrepancies observed in RT and MT achievement of DS children. Lack of significant differences within the DS group indicates these children are not receiving the benefits of physical education activities leading to eventual distinctions by sex. Public school physical education programs should provide opportunities for all children to develop their innate movement abilities. Proponents of appropriate mainstream efforts should consider such needs.

Ernest K. Lange, Ed.D.
Department of Physical Education
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March 17, 1979
12:15 pm

## THE EFFECTS OF COMPETITION AND INSTRUCTIONAL SETS ON THE SPEED AND ACCURACY COMPONENTS OF A THROWING TASK.

John B. Gross, University of Waterloo; Diane L. Gill, University of Waterloo.

The speed and accuracy components of a dart throwing task were examined under instructional conditions which varied on a continuum from extreme emphasis on speed through specific speed and accuracy trade-offs to extreme emphasis on accuracy. In addition subjects were tested under competitive and non-competitive conditions. The hypotheses proposed were: (1) subjects follow a 'cognitively flexible' approach to performance (i.e., they trade-off speed and accuracy according to the specific instructions) and, (2) Competition facilitates speed and impairs accuracy. Twelve male university students took part in the two testing sessions on different days. They were required to compete against another subject on one of those days and performed alone under noncompetitive conditions on the other day. During each session subjects threw 100 trials consisting of two blocks of 10 trials for each of the 5 Instructional Sets. The Instructional Sets varied from extreme emphasis on speed to extreme emphasis on accuracy. The order of competitive and non-competitive sessions was counterbalanced yielding an Order X Competition-Noncompetition X Instructional Sets X Blocks (2 X 2 X 5 X 2) repeated measures design. Dependent measures for performance were speed (time in msec from key release to target impact) and accuracy (radial error in cm from the centre of the target). As hypothesized the MANOVA yielded a significant main effect for Instructional Sets on speed and accuracy. Speed and accuracy means revealed a strong trade-off effect with speed increasing and accuracy decreasing across the 5 Instructional Sets. The multivariate Competition main effect was nonsignificant but a univariate ANOVA indicated that competition facilitated speed at all Instructional Sets.

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March 17, 1979
12:00-2:00 pm
Poster #1

**THE ROLE OF EXPECTANCY IN CONSTRAINED MOVEMENT PRODUCTION AND RECALL.** Robert W. Johnson, David Ben-Sira, University of Minnesota.

The purpose of this experiment was to examine the influence of subject expectancies on the production and recall of constrained movement sequences. Thirteen undergraduate volunteers were asked to perform 24 constrained movement productions and reproductions on a linear positioning apparatus. Subjects were informed that each of the criterion movements to be presented would be initiated from the same starting location and would terminate in either of two specific target areas. Prior to each criterion movement production subjects were asked to report in which of those areas they most expected the movement to terminate. Deviations from the criterion target position, recorded to the nearest millimeter, were converted to algebraic or constant error (CE), and absolute error (AE) statistics. Analysis of AE revealed significant differences between shorter movement productions which followed a prediction of "short" and those which followed a prediction of "long". No significant AE differences were noted for the longer movement contrasts. Although inspection of the CE data indicated a tendency for subjects reproducing shorter movements to bias them in the directions of their expectations, the trend was not significant. The following movement parameters were obtained during the criterion movement production phase of the last four trials: (1) total time taken to complete the movement sequence (MT), (2) maximum velocity occurring during the sequence (VMAX) and (3) velocity at termination (VT). Analysis of these parameters revealed that when subjects produce shorter movement sequences they tend to have higher MT, lower VMAX and VT scores when predicting a shorter sequence than when predicting a longer sequence. No differences were found in the longer movement contrasts. The results were interpreted to support the notion that expectancies influence the performance of constrained movement sequences.

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March 17, 1979
12:00-2:00 pm
Poster #2

**EFFECTS OF PRECISENESS OF KR ON THE RATE OF INFORMATION LOSS FROM MOTOR MEMORY: RELATIONSHIP TO AGE.** Melinda Solmon and Jerry R. Thomas, Department of Health. Physical and Recreation Education, Louisiana State University. Baton Rouge LA 70803.

In motor skill acquisition the complexity of knowledge of results (KR) from each trial should interact with the child's processing rate, which has been demonstrated to increase with age. A precise level of KR, provided the learner can process it, should produce a stronger perceptual trace than general KR, given a moderately difficult task and an equal number of trials. To evaluate this hypothesis, 27 second and 27 fourth grade children were randomly assigned within grade level to three levels of KR: no KR, general KR, and precise KR. Subjects were given 40 acquisition trials and 20 KR withdrawal trials on a curvilinear positioning task. The withdrawal trials were administered so that the strength of the perceptual trace established under the experimental conditions could be evaluated. When KR is withdrawn, the stronger perceptual trace should be more resistant to forgetting. Results suggested that while KR was better than no KR during learning the level of KR preciseness was of minor importance. However the preciseness of KR was of considerable value after KR was withdrawn (retention phase). The older children were able to use more precise KR to form a perceptual trace more resistant to forgetting than either the younger children or the children their own age who received only general KR. The second graders were unable to use as effective strategy as fourth graders for labeling and coding error information that was complex. However, when the error information was simplified the general KR was processed by both age levels establishing a comparable perceptual trace across age in which no differences in retention were evidenced.

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March 17, 1979
12:00-2:00 pm
Poster #3

**SHORT-TERM RETENTION OF KINESTHETIC DISTANCE INFORMATION UNDER TWO CONDITIONS OF INTERPOLATED ACTIVITY. Edgar W. Shields, Jr., University of North Carolina at Chapel Hill.**

One hundred and eighty blindfolded subjects were tested individually on a lever-positioning apparatus which had a functional arc of 120° and permitted measurement of movements to the nearest one-half degree. Subjects were randomly assigned to one of six experimental groups. Each experimental group was tested under one of two different conditions of movement distance and under one of two different conditions of interpolated activity. Movement distance was classified as being either short, intermediate, or long. Covert rehearsal and a mental task involving mathematics were the two conditions of interpolated activity. Each subject made a criterion movement to a stop after which he engaged in the specified interpolated activity for a forty-five second retention interval. Reproduction movements had different starting points than the criterion movements. Each subject reproduced eight movements with algebraic error being recorded for each reproduction attempt. Absolute error, constant error, and variable error were calculated from the eight algebraic error scores for each subject. The result was three criterion variables per subject which were analyzed separately through a univariate ANOVA. The Tukey HSD procedure was utilized for post hoc analysis. Effects of interpolated activity ($P<.001$) and movement distance ($P<.001$) were found to be significant with respect to constant error. The interaction effect was not significant ($P>.05$). Post hoc analysis of movement distance revealed a significant difference ($P<.05$) between short movements and long movements for constant error. Movement distance was found to be the only variable having a significant effect ($P<.001$) on both absolute error and variable error. Post hoc analysis indicated a significant difference between all levels of movement distance ($P<.05$) for both absolute error and variable error. Conclusions drawn from the data compiled and analyzed in this study were: 1) the capacity to retain, on a short-term basis, kinesthetic distance information is a function of the distance of the movement; 2) an attention demanding mental task involving mathematics serves to augment, on a short term basis, the memory trace of kinesthetic distance; and 3) an attention demanding mental task involving mathematics does not appreciably affect the variability of responses in an attempt to retain, on a short-term basis kinesthetic distance information.

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**March 17, 1979**
**12:00-2:00 pm**
**Poster #4**

## THE EFFECT OF STRENGTH TRAINING ON FRACTIONALIZED ACCURACY.

C. Eric Gronbech, Chicago State University

Accuracy necessitates a working together of both the perceptual and motor systems. Lack of success may be identified in either a directional sense, a distance sense or any combination of both. To have accurate direction a subject must time his release relative to the position in the arc at which the projection occurs. To be accurate in distance the performer must call forth the correct magnitude of force accomplished through the recruitment of the proper number of motor units in the most efficient combinations. It was the purpose of this investigation to test the hypothesis that weight training which brings about a significant increase in strength of the muscles directly responsible for accurate repetition of a task without accompanying practice in that task, would have a detrimental affect on the reproduction of the previous level of performance. This study was further designed to test the duration of this of this effect and its long term affect on accuracy based on a second theory, the increased strength of the fibers would permit the afore learned task to be accomplished with fewer motor units thereby eliminating some complexity in the neuromotor coordination. 40 S's were trained for five days to exert a force equal to 50% of their maximum strength in the dominant arm elbow flexors against a fixed dynamometer. Following training, the group was tested then randomly assigned to either the treatment or control group. For the next seven weeks the treatment group trained to increase this strength. After the treatment period the S's were retested on the task to determine the extent to which the previous level of performance was retained. The pre and post test, post training, as well as pre and post treatment maximal strength scores were subjected to the appropriate ANOVA to determine the effectiveness of the task treatment and its effect on the performance of the task. The results of the statistical procedures inferred success in the weight training program and a detrimental effect on accuracy. Visual analysis of of the post training period supported the theory of a long term increase in accuracy.

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March 17, 1979
12:00-2:00 pm

**AN ASSESSMENT OF THE LOCUS OF THE RANGE EFFECT**, Roger Simmons, San Diego State University; Robert Johnson, University of Minnesota.

The study attempts to investigate whether range effects which are defined as an over estimation of short movement lengths, and under estimation of long movement lengths, occur as a result of position relative to the body midline, or as a function of the movement extent regardless of the position relative to the body. Ninety male and female subjects completed four short and four long movements on a linear positioning task. Experimenter defined movements were situated such that the end location (terminal location) of both types of movement was 30 cm to the right side of the subject's midline or 30 cm to the left of the body midline. Each subject was randomly assigned to one of the six treatment combinations. Analysis of algebraic error data indicated that range effects were present for the terminal location positioned to the left and center of the body midline but not the right. In addition, analysis of variable error data indicated greater variability in recall of long movement extents although the variability at this length diminished as the terminal location position was moved further to the right. It was concluded that range effects are maximized when movements are orientated to the left of the body midline and minimized when orientated to the right side of the body midline.

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March 17, 1979
12:00-2:00 pm
Poster #6

**THE EFFECT OF A 10-DAY PERIOD OF ALCOHOL CONSUMPTION ON SELECTED MEASURES OF PHYSICAL PERFORMANCE.** Gayle MacDonald, Beaverton Public Schools; Milan Svoboda, Portland State University.

The purpose of the study was to determine whether the daily consumption of alcohol by fit persons engaged in regular training had a cumulative effect on performance, assuming the immediate effects of the last drink had time to wear off. Eleven athletes were tested before and after a 10-day experimental period in which normal training habits were maintained along with a nightly dosage of alcohol (.2 cc of 95% alcohol/lb of body weight in a 20% solution). The post-tests were administered on the day following the last drink (mean time lapse = 19.7 hrs.). Each athlete served as his own control by being tested under identical conditions over another 10-day period without the alcohol consumption. Subjects were assigned to the experimental or control condition in alternating order at the time of the first pre-test. Tests included: pull-ups, jump-reach, reaction time, grip strength, and heart rate response to a 6-minute bicycle ergometer ride. To control for the possible influence of training on changes in test scores, fit athletes were used as subjects. Habitual training levels were maintained during the study, and comparisons between scores on the pre and post tests of the control condition were found to be non-significant in all cases except for grip strength. To determine whether learning influenced test scores, comparisons between the first and second pre-tests scores were made and found to be non-significant in all cases except for grip strength. To ascertain whether regular alcohol consumption had a cumulative influence on performance, change scores (post-test minus pre-test) were calculated for the experimental and control conditions and compared. None were found to be significantly different. It was concluded that with the alcohol dosages and test items utilized, regular consumption of alcohol does not have a cumulative effect on performance during a 10-day period.

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March 17, 1979
12:00-2:00 pm
Poster #7

71

# TAKE-OFF FOOT PLACEMENT AS A VARIABLE INFLUENCING HIGH JUMP PERFORMANCE IN LOW, MODERATE, AND HIGHLY SKILLED JUMPERS.

Charles W. Armstrong, University of Toledo

In high jumping the placement location of the take-off foot has long been thought to be an important determinant of performance. Of particular concern has been the distance between the take-off point and the crossbar, as this distance represents the minimal amount of horizontal displacement that must occur if clearance is to be accomplished. It seems likely that variation of this distance, around a theoretical optimum, may have a negative influence on performance. The purpose of this study was to investigate several factors relating to placement of the take-off foot in jumpers using the flop technique. Of primary concern were: the relationship between bar height and take-off placement; the relationship between placement and jump success; and differences in placement location and consistency between low, moderate, and highly skilled jumpers. One hundred thirty five attempts, at heights ranging from 1.40 to 2.21 meters were recorded on film. Subjects ranged from 17 to 22 years of age and evidenced previous personal bests of 1.40 to 2.26 meters. Analysis of the films provided a measure of the distance between the take-off point and the crossbar. Review of the data indicated that take-off point to bar distance and bar height were correlated ($r = .595$). A one-way ANOVA revealed significant differences $[F(2, 132) = 84.22, p \leq .001]$ between the low, moderate, and highly skilled subjects. Post hoc analyses revealed that all comparisons were statistically significant. Group deviation scores suggested that placement consistency and skill level were related. Point-biserial correlations for each group revealed that foot placement and jump success were related, but only for the moderately skilled subjects. The findings permit only tentative conclusions regarding the problems. It appears that jumpers generally adjust to greater heights by increasing the take-off point distance. However, at a given height it may be that success is most likely when the take-off distance is slightly decreased. Additionally, it appears that placement consistency may be related to skill level.

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March 17, 1979
12:00-2:00 pm
Poster #8

## *BODY COMPOSITION AND BODY BUILD CHARACTERISTICS OF JUNIOR OLYMPIC ATHLETES.*

W. Thorland, G. Johnson, T. Fagot, and R. Hammer, Department of Physical Education, University of Nebraska-Lincoln, Lincoln, Nebraska 68588.

Body composition and body build characteristics of national-caliber, junior-level competitors were assessed to determine the extent to which specific traits characterized young performers of different athletic events. Anthropometric characteristics were determined on participants in the 1978 National AAU Junior Olympics. Within the sample of males ($\bar{X}\pm SD=17.2\pm 0.9$ yrs.) were 23 distance runners, 9 sprinters, 6 throwers (shot put, discus, javelin), and 10 gymnasts and divers. Within the sample of females ($16.1\pm 1.4$ yrs.) were 19 distance runners, 12 sprinters, 8 throwers, and 24 gymnasts and divers. Body composition was determined by underwater weighing and body build was characterized in circumference-based somatograms (Behnke) utilizing k values respectively derived from all males and from all females sampled. The results revealed similar trends within both the male and the female samples. The throwers were the largest group in terms of height, weight, relative fat, fat weight, and lean body weight. The gymnasts and divers were the smallest group in terms of height, weight, and lean body weight, although the sprinters were the leanest group in terms of relative fat. Sprinters were similar to gymnasts and divers in terms of somatogram patterns, with both groups demonstrating little deviation from normal proportioning of body circumferences. Furthermore, with the exception of relatively small arm girths, distance runners also demonstrated essentially normal proportioning of body circumferences. However, throwers displayed arm and thigh circumferences of proportions much larger than those observed in the other groups of athletes. In conclusion, various body composition and body build characteristics tended to distinguish junior level competitors of different athletic events. Furthermore, both males and females displayed similar trends in these distinguishing anthropometric traits.

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March 17, 1979
12:00-2:00 pm
Poster #9

## PREDICTION OF RESIDUAL VOLUME FROM ANTHROPOMETRIC MEASURES ON NINE AND TEN-YEAR-OLD GIRLS.

Scarlet Johnson, Oral Roberts University; James Schwane, Oral Roberts University; Marlene Muncy, Oral Roberts University

There is currently a need for an interest in developing body composition norms for children. To best accomplish this, body density measurements must be performed on many children at numerous geographical locations. Hydrostatic weighing is probably the technique of choice for such a population study, since it is accurate, tanks or pools are widely available, and little additional equipment is required. However, this technique loses its validity without accurate determination of residual volume, and practicality for widespread use is lost if the time, equipment, and technical expertise necessary for actual measurement of RV would be required at many sites. A method of accurately estimating RV is required for such a population study. The purpose of this study was to develop an equation for prediction of RV from anthropometric measures in a sample of 9 and 10-year-old girls. The sample consisted of 66 Caucasian females ($\bar{X}$= 10.4 yrs) attending a suburban elementary school in Oklahoma. The following anthropometric measures were taken by a trained technician: height, weight, sitting height, nipple line and xiphoid level circumferences, abdominal circumference, chest widths at the nipple and xiphoid levels, and chest depth at the xiphoid. RV was directly measured by the nitrogen equilibration method. A minimum of three determinations were made on each subject while in a seated position, with the average of the closest two values used as the criterion score. ($\bar{X}$ RV= .416 ± .10 1) The anthropometric data were submitted to multiple regression analysis with the laboratory-determined RV functioning as the dependent variable. This analysis yielded the following prediction equation:

$$\begin{aligned} RV = {} & .0190\ (\text{sitting ht in cm}) - .0162\ (\text{abd cir in cm}) + \\ & .019\ (\text{Chest width nipple line in mm}) - 0.4625 \\ & R = .75 \quad SE = .061\ 1 \end{aligned}$$

The RV estimate by this equation, when used with hydrostatic weighing, would result in an error of 1.6% fat or less in 95% of children represented by this sample. If these results can be cross-validated on other samples, this estimate seems appropriate for use in a large population study of body composition.

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March 17, 1979
12:00-2:00 pm
Poster #10

## TOTAL BODY VOLUME IN FEMALES: VALIDATION OF A THEORETICAL MODEL.

Patty Freedson, Stanley Sady, Victor Katch, University of Michigan.

The validity of a previously published (Sady et al 1978) geometric model for calculating segmental and total body volume was investigated in fifty-seven females ($\bar{X}$ age=24.9 yrs). The geometric model used three shapes (right angles parallelpiped, frustrum of a pyramid, truncated right circular cone) to represent ten body segments (head-neck, upper chest, chest, foot, hand, hips, thigh, calf, upper arm, and forearm).

The sum of the calculated segment volumes correlated $\underline{r}$=.96 (SEE=±3.4% of the mean) with the densiometrically determined total body volume. Validity coefficients between criterion (water displacement) and calculated segment volumes ranged from $\underline{r}$=.52 (forearm) to $\underline{r}$=.88 (calf) (SEE=±6.4 to 14.5% of the mean). Significant ($p < .01$) mean differences were present between several of the actual vs calculated segment volumes. Specifically, systematic overestimation occurred at the foot (-.06 l), thigh (-.51 l) and hand (-.03 l) with underestimation present at the calf (+1.38 l) and forearm (+.18 l). Additionally, there was a constant overestimation of total body volume for the females (-5.46 l) ($p < .01$) and an underestimation for the males (Sady et al 1978: +1.74 l) ($p < .01$). Covariance analysis between the criterion and calculated total body volume revealed significantly ($p < .01$) different slopes between the sexes. These data suggest that modification of the model is necessary to account for sexual dimorphism in body shape and proportionality.

The magnitude of the mean differences and the variable errors associated with the theoretical vs criterion scores might raise some questions concerning the validity of body modelling schemes for prediction of body composition parameters. We suggest however, that our geometric representation of the body is biologically more meaningful than statistical exercises (i.e. multiple regression analysis) which may or may not mathematically reduce the sum of squared deviations between a criterion and predicted variable.

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**March 17, 1979**
**12:00-2:00 pm**
**Poster #11**

# THE OXYGEN COST OF AN ISOTONIC CIRCUIT STRENGTH PROGRAM.

Timothy Strathman, Larry Gettman, Lynne Culter, Institute for Aerobics Research, Dallas, Texas.

The purpose of this study was to examine the aerobic demands of an isotonic circuit strength program. Nine males ($\bar{X}$ age = 30.1 yrs and $\bar{X}$ body weight = 80.3 kg) were monitored continuously for oxygen uptake ($\dot{V}O_2$) and heart rate (HR) using semi-automated equipment. Subjects completed two circuits of 10 exercises with 12 reps/exercise at 50% maximum strength resistance and 30 sec rest between each station. $\dot{V}O_2$ averaged 1.51 L/min (19.2 $ml/kg{\cdot}min^{-1}$) for the first circuit and 1.75 L/min (21.9 $ml/kg{\cdot}min^{-1}$) for the second circuit for an overall average of 1.63 L/min (20.5 $ml/kg{\cdot}min^{-1}$). This represented 8.2 kcal/min or 176 total kcal for the 21 min 36 sec workout. Working HR during exercises and recovery HR averaged 153 and 137 beats/min, respectively. $\dot{V}O_2$ and HR intensities were 41% and 67% of maximum values, respectively. Pulmonary ventilation, respiratory quotient, and peak serum lactic acid levels averaged 62.4 L/min, 1.05, and 145.3 mg/dl, respectively. All values were similar but slightly lower than previous studies on circuit isokinetic programs. It was concluded that the rate of aerobic energy expenditure (8.2 kcal/min) was sufficient to stimulate moderate development of cardiorespiratory function; however, the duration of the program would probably have to be extended beyond the 21.5 min workout.

Supported by the Leland Fikes Foundation, Dallas, Texas.

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March 17, 1979
12:00-2:00 pm
Poster #12

**THE ENERGY COST OF CHEST COMPRESSION DURING CARDIOPULMONARY RESUSCITATION.** G. Harley Hartung and William G. Squires, The Methodist Hospital, Baylor College of Medicine, Houston, Texas.

The purpose of this study was to determine the energy expenditure during the chest compression phase of cardiopulmonary resuscitation (CPR). Oxygen uptake was determined in six healthy subjects (3 male and 3 female) whose ages ranged from 26-44 years. All subjects were certified in accordance with American Heart Association CPR standards. The subjects used a Recording Resusci Anne mannequin and compressed with the required pressure at a cadence of 70 compressions per minute for 10 minutes. Oxygen uptake was measured during the fifth and tenth minutes and mean values of 15.09 and 15.45 ml/kg/min respectively were recorded indicating that a steady state oxygen uptake was reached. Maximal oxygen uptake ($\overline{X}$=54.75 ml/kg/min) was determined by the open circuit method during treadmill testing in order to ascertain the percentage of maximum that was utilized during CPR. The mean maximum heart rate during CPR was 122.5 compared with a mean maximum of 186.6 obtained during the graded exercise test. The subjects worked at a mean value of 66% of the measured maximum heart rate whereas only 28% of their maximal oxygen consumption was utilized during the CPR trial. Five of the subjects repeated the CPR protocol and correlation coefficients determined for oxygen uptake and heart rate during the 10th minute were .986 and .955 respectively. The oxygen uptake during CPR is quite low in relation to the increase in heart rate and is much lower than the oxygen cost of leg work demanding a comparable cardiac response. It appears that the performance of such predominantly arm/upper body work is not hazardous for the young, relatively fit individual but may be potentially hazardous for the older cardiovascular impaired person whose myocardial oxygen demand is increased by the relative isometic component of CPR.

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March 17, 1979
12:00-2:00 pm
Poster #13

77

## AEROBIC CHANGES THROUGH 10 WEEKS OF ISOKINETIC AND ISOTONIC CIRCUIT STRENGTH TRAINING.

Lynne Culter, Larry Gettman, Timothy Strathman, Institute for Aerobics Research, Dallas, Texas.

The purpose of this study was to compare the effects of isokinetic (IK) and isotonic (IT) circuit strength training (CST) through 10 weeks of training 3 days/week. Sedentary male subjects were randomly assigned to IK (n=14), IT (n=14), and Control (C)(n=5), $\bar{X}$ ages were 31, 32, 32, respectively. The training groups completed 2 circuits of 9 exercises, 12 reps/exercise at approximately 50% of their max strength. Work per training session increased 17% for IT ($p <.01$) but showed no change for IK. Workout time decreased for both IK and IT groups [29:40-28:00, ($p <.05$) and 24:32-21:50, ($p <.05$), respectively]. Body weight, % fat fat weight, and lean weight showed no significant changes for any group. The groups were randomly assigned to either a rowing (R) ergometer (IK, n=8; IT, n=8; C, n=3) or a treadmill (T) (IK, n=6; IT, n=6; C, n=2) $\dot{V}O_2$ max tests. Although the $\dot{V}O_2$ max improvements were not statistically significant ($p <.05$) both the R and T tests showed a change in $\dot{V}O_2$ $L \cdot min^{-1}$ ($+15\%_{IK}$, $+5\%_{IT}$ and $+2\%_{IK}$, $+3\%_{IT}$, respectively). $\dot{V}O_2$ $ml/kgLBW \cdot min^{-1}$ showed similar changes for R and T tests ($+14\%_{IK}$, $+6\%_{IT}$ and $0\%_{IK}$, $+5\%_{IT}$, respectively). All reported values were similar but smaller than previous studies on IK or IT circuit strength training. It was concluded that in order to produce more significant changes the duration would probably have to be extended to 3 circuits (greater than 28:00 minutes).

Supported by the Leland Fikes Foundation, Dallas, Texas

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March 17, 1979
12:00-2:00 pm
Poster #14

**AN ANALYSIS OF PHYSICAL FITNESS SCORES AND EXTREME LEVELS OF SELF ASSERTIVENESS AND ATTITUDES RELATED TO SELF ASSERTIVENESS AND PHYSICAL FITNESS OF HIGH SCHOOL FEMALES.*** Ronald A. Siders, Owen J. Holyoak, and Robert E. Allen, University of Florida; Clair Tuefel and Karen Roberts, Pinellas Park High School.

The purpose of this study was to investigate the effects of extreme levels of self assertiveness and attitudes related to self assertiveness and physical fitness upon selected physical fitness parameters of high school females. The subjects were 305 high school girls enrolled in the 10th and 11th grade physical education program at Pinellas Park High School, Largo, Florida. Each subject participated in a six week program in physical education with an emphasis on physical fitness. The physical fitness tests used to measure the organic parameters were: Right and left grip strength using a grip dynamometer, one minute situp test, flexed arm hang, hip flexion and extension using a Leighton Flexometer, and the 12-minute run. Attitudes related to self assertiveness and physical fitness were measured by Osgood's semantic differential. Assertiveness was measured by the Rathus Assertiveness Schedule. Each subject was pretested on all test items, put through the six week program, and then posttested on each item. Posttest scores on each area of the semantic differential and the assertiveness scales were divided into thirds with the upper and lower thirds used to determine the extreme levels for each test. Comparisons were then made between the upper and lower groups on each of the fitness items. The data were analyzed at the University of Florida Computing Center using an independent t-test. The .05 level of significance was selected for all comparisons. The results indicated that high levels on the semantic differential were significantly different than the low levels on 14 of the 49 fitness comparisons. No significant differences were found between high and low levels of self assertiveness. Based upon the results of this study, it was concluded that (1) extreme levels of self assertiveness have no effect upon physical fitness scores, (2) physical fitness parameters were not affected by extreme levels of the potency factor for attitudes toward self assertiveness nor physical fitness, and (3) high scores on the action and evaluation factors are associated with higher scores on the physical fitness parameters.

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* This study was supported, in part, by the College of Physical Education, Health, and Recreation at the University of Florida.

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March 17, 1979
12:00-2:00 pm
Poster #15

# ASSESSMENT OF PREADOLESCENCE MOTION PREDICTION.

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The present study was designed to investigate motion prediction performance characteristics of young children. Thirty males and 30 females were included in the following age groups: 6-7, 8-9, and 10-11 year olds. Each subject received one hundred trials on a motion prediction task. A 3 by 2 by 20 factorial design was used for absolute error, absolute variance, constant error, and variable error. The independent measures considered were age, gender, and blocks of trials. The results indicated that variability and error scores for the six to seven year olds were somewhat larger than the two older age groups (eight to nine and ten to eleven year olds). However, no tendency for directional error was noted. Males were found to exhibit significantly less error and variance than female subjects. Initially, the male subjects overestimated while the females underestimated. Thereafter, performance interchanged with no tendency to either direction.

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March 17, 1979
1:00 pm

**DEVELOPMENTAL CHANGES IN PROCESSING TIME FOR ACQUISITION OF A SIMPLE MOTOR TASK. JERE DEE GALLAGHER, LOUISIANA STATE UNIVERSITY; JERRY R. THOMAS, LOUISIANA STATE UNIVERSITY.**

With increasing age, an ability to cognitively process more information within the same time limits, or process the same information in a shorter time frame is clearly supported in the literature. The information given a child for improvement of a motor skill on the next trial is consequently a function of the degree to which the information can be processed. Variation of the post-KR interval appears to be a method of determining the interaction of age and degree of processing. This study used 3, 6 and 12 sec post-KR intervals to investigate the relationship of interval length and the increased capacity associated with aging of children to process information.

For 26 trials, 30 first, third and fifth grade females attempted to locate a hidden target on a kinesthetic curvilinear positioning task with a precise level of KR being administered. Findings indicated that increasing the post-KR interval produced general facilitative effects for motor performance within each age group. Improved performance was evident not merely in accuracy judgments but in the reduction of the child's variability of performance.

Trends noted in the data were that the 3 sec interval was detrimental to all age groups but of more severe detriment to the first graders. Differences among the three intervals was clearly evident for the first and third grade subjects. The fifth graders scores were similar for the 6 and 12 sec interval, but those scores were different from the 3 sec interval. Thus, for the older children, 6 secs was enough time to adequately process the information. Implications from this study suggest that older children can indeed process information about motor performance more rapidly than younger children. This increase in processing speed results in both increases in performance and reduction of variability.

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March 17, 1979
1:15 pm

**BENEFITS OF ORGANIZATION ON LEARNING AND RETENTION. Virginia A. Diggles, University of Wisconsin-Madison.**

It has been shown previously that perceptual organization can be a potent factor in the learning and retention of simple motor skills. The present research effort was designed to further elaborate on the potential benefits of experimenter presented organization (EPO) to the learning and retention of a linear positioning task. Organization was defined as the sequential presentation of five movements of progressively longer lengths; a random order of presentation constituted an unorganized input. Subjects were 120 male and female students and were randomly assigned to one of four experimental groups. The groups were determined by the four combinations of sequential and random presentations on two phases of performance yielding sequential-sequential (SS), sequential-random (SR), random-sequential (RS), and random-random (RR) groups. Crossed with these groups were the presence or absence of knowledge of results (KR) during phase I, and the retention interval between phases (0, 2 or 4 days). Subjects were nested within the groups x KR x days combination. Each subject performed 10 trials/phase, each trial consisting of the prescribed order of 5 movements (10, 20, 30, 40, and 50 cm). Analysis of variance was performed on each phase using absolute error scores (AE). In phase I, all main effects were significant; Groups, KR, Trials, and Movements. In phase II, the main effect of Groups and Movements were significant. The results indicated that organization did benefit performance. The benefit, however, appeared to be specific to the phase in which organization was presented. Organizational benefits did not appear to transfer from phase I to phase II, contrary to previous findings. The presence of organization equated performance of the sequential group without KR to the random groups with KR. Although the effects of retention intervals were not significant, they reflected the general trend of the other variables, that is the groups with organization retained lower error levels over the intervals. This study supports the beneficial effects of experimenter presented organization to the learning and retention of a simple motor task.

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March 17, 1979
1:30 pm

## THE USE OF MULTIVARIATE TECHNIQUES IN DETERMINING ELECTROMYOGRAPHICAL CHANGES OCCURING DURING THE ACQUISITION OF A MOTOR SKILL.

David A. Ludwig, Iowa State University.

Currently there are only a few studies which attempt to explain the neuromuscular changes which accompany skilled motor learning. Even though these explanations seem feasible there is much disagreement between studies and further verification is needed. Most of the research to date utilizes a pre-test, post-test design which is not conducive to regression analysis. A more descriptive model needs to be obtained which samples the practice trials across the entire practice session. This approach would be much improved over the pre-test, post-test design in that more information concerning learning trends would be available. It is therefore the primary purpose of this study to describe the effects of learning a motor skill on integrated EMG activity and timing as it occurs across practice. Subjects consisted of ten under-graduate males enrolled at Iowa State University. A shuffle board task was devised that isolated the triceps as the major agonist, and the biceps as the major antagonist. The task was performed in one plane with strict controls that prevented extraneous body and limb movement. Integrated EMG maps from both the triceps and biceps were analysed for timing and electrical characteristics. Since a uniform variance covariance matrix could not be assumed across time periods, the sums of squares due to time and error were subdivided into components arising from the single degrees of freedom based on polynomial regression. Through this type of subdivision multiple error terms were generated and used to test linear, quadratic, and cubic trends for seven EMG characteristics obtained from a two trial sample taken every tenth trial over a practice schedule of 100 trials. Results indicated a significant change in triceps (agonist) timing characteristics. No changes were seen in the integrated electromyographs for either the triceps or biceps. Subject means for movement time, time to peak activity, and latency period exhibited significant linear trends (negative) across the 11 time periods. The author concluded that movement time plays a vital role in the time spent in learning a motor task. Achievement of proper performance speed as soon as possible during practice may shorten the time needed to learn a motor skill.

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March 17, 1979
1:45 pm

### RELATIONSHIP BETWEEN EXTRINSIC REWARDS, INTRINSIC MOTIVATION AND CAUSAL ATTRIBUTIONS IN A COMPETITIVE SETTING.

Robert Weinberg, and Allen Jackson, North Texas State University.

The purpose of the present investigation was to determine the effect of monetary rewards and success-failure on intrinsic motivation and causal attributions of males and females competing on a motor task. Forty male and forty female University of California, Los Angeles students were given ten trials, each thirty seconds in duration, on the stabilometer. Subjects were told that the experimenter would tell them how they did in relation to the norms established for this task. Males and females were randomly assigned to either a reward (money) or no reward condition and received either success or failure feedback during competition. Thus the design was a 2 x 2 x 2 with male/female crossed with reward/no reward and success/failure. The major dependent variables were subjects' intrinsic motivation for the task as measured by questionnaire and their attributions for success-failure. Multivariate analysis of variance produced a significant overall main effect for feedback with subjects exhibiting more intrinsic motivation after success than after failure. The Sex x Feedback interaction indicated that males exhibited more intrinsic motivation than females after success whereas females displayed more intrinsic motivation than males after failure. No significant differences were found for the reward variable. Attribution results showed that success was primarily attributed to high ability, high effort and good luck while failure was attributed to low ability, low effort and bad luck. Correlational analysis revealed that success was strongly related to high ability, high effort, good luck and high intrinsic motivation. Conversely, failure was strongly associated with low ability, low effort, bad luck and low intrinsic motivation. Intrinsic motivation results are discussed within the framework of Deci's cognitive evaluation theory and Deaux's theory of sex differences in social behavior. Attributional results provided limited support for the self-enhancement hypothesis. The relationship between causal attributions and intrinsic motivation are in support of Weiner's attributional model. Implications and application for competitive physical activity are drawn.

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March 17, 1979
2:00 pm

**FURTHER TESTS OF SCHMIDT'S SCHEMA THEORY: DEVELOPMENT OF A SCHEMA RULE FOR COINCIDENT TIMING SITUATIONS.** C. A. Wrisberg & M. R. Ragsdale, Motor Behavior Laboratory, University of Tennessee.

The present study investigated the generalizability of Schmidt's (1975) schema theory to an open skill (Poulton, 1957) situation. Subjects attempted to time a preferred-hand button press coincident with the lighting of the last of a series of runway lights moving at a velocity of 9 mph. Prior to 5 trials of performance on the criterion task subjects received 40 trials in which they either (a) watched (low response requirements) or (b) responded with the non-preferred hand (high response requirements) to a stimulus moving at (a) a constant (5, 7, 11, or 13 mph) velocity (low stimulus variability) or (b) different velocities (high stimulus variability) from trial to trial. Absolute error and constant error were calculated on each criterion coincident timing trial. Separate 2(response requirements) x 2(stimulus variability) x 2(gender) x 5(trials) factorial ANOVAs with repeated measures on the last factor were performed on each error score. Subjects receiving high stimulus variability and high response requirements during training had significantly lower absolute error on the criterion task than those in the other conditions. Moreover, the stimulus variability differentiated the timing performance of females more than that of males. The results were discussed in terms of the type of practice which facilitates development of a schema rule for coincident timing situations.

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March 17, 1979
2:15 pm

## EFFECTS OF MOVEMENT TIME AND EXTENDED PRACTICE ON THE CONTROL OF COINCIDENT TIMING TASKS. Charles H. Shea, Texas A&M University.

The present study investigated the extent to which movement time and practice influenced usage of feedback by subjects to make corrections in the spatial-temporal movement pattern of coincident timing responses. Twenty-four college males and females watched a .01 SEC timer and attempted to knock over a barrier at the precise moment that the timer sweep hand reached a "Target Position" (250, 500, or 1000 MSEC). The speed of the movement to the barrier was monitored by a series of photocells placed at equal intervals along the movement line. All subjects were given 100 trials of practice at a particular "Target Position" on each of four consecutive days. Schmidt's (1972) index of preprogramming was calculated for each subject on each day in order to estimate the level of feedback involved in controlling the movement. The spatial-temporal pattern of the response was characterized by fluctuations in the speed of the movement to the barrier. The results indicated that the index of preprogramming increased as movement time decreased but remained stable throughout practice. Likewise, the spatial-temporal pattern of the response was found to fluctuate as movement time increased but remained stable over practice. That is, the 250 and 500 MSEC movements appeared to be primarily ballistic while the 1000 MSEC movement appeared to be adjusted in the terminal phase by accelerating or decelerating the rate of movement. The results suggest that movement time and not practice limits the extent to which a response is programmed, with rapid performance more likely to be preprogrammed than slower performance. In addition, it should be noted that the interpretation of the index of preprogramming coincided with that of the spatial-temporal pattern of movement.

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March 17, 1979
2:30 pm

## KINESTHETIC SPATIAL CODING WITHIN EGOCENTRIC SPACE.

Douglas D. Larish; George E. Stelmach, University of Wisconsin-Madison.

The target hypothesis (MacNeilage, 1970; Russell, 1976) represents one explanation of how humans orient their limbs in space. According to this hypothesis proprioceptive cues signalling the terminal position of a limb are transformed into an abstract location code. This code, and not the direct proprioceptive cues, then provides the basis for movement reproduction. For the target hypothesis to be a viable explanation of limb localization it must be shown that the abstract code can be accessed in memory independent of the proprioceptive cues responsible for its initial storage. Two experiments were conducted to assess the target hypotheses' credibility in spatial orientation tasks performed in the coronal plane and mid-transverse plane. The switched limb technique (Wallace, 1977) was used in a typical short-term motor memory paradigm. In Experiment I (N=12), subjects executed same and switched limb movements vertically upward in the coronal plane. In Experiment 2 (N=11), subjects executed same and switched limb movements horizontally away from the body in the mid-transverse plane. The results from both experiments revealed that same and switched limb accuracy were equivalent at short locations (10-35 cm), whereas, switched limb accuracy was worse than same limb accuracy at long locations (40-60 cm). It was concluded the reliable movement control based on the abstract code is limited to instances when movements are performed inside an egocentric, body based reference system. Consequently, the generalizability of the target hypothesis must also be restricted to these instances.

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March 17, 1979
2:40 pm

## PREFERRED COGNITIVE MODE AND TEACHING METHODOLOGY: MATCHING SEQUENTIAL AND HOLISTIC INFORMATION PROCESSING WITH PART AND WHOLE METHODS IN LEARNING A NOVEL MOTOR SKILL.

Mary Jo Murray, Northeast Missouri State University.

The purpose of this study was to examine the whole-part methodology issue for teaching physical skills in view of individual differences in the learner's cognitive style. A coeducational pool of 429 undergraduate college students began the study. The Learning Skills Inventory which is a modified cognitive map and the lateral eye movement phenomenon were utilized to identify particular learner characteristics. One hundred subjects were finally classified as either holistic or sequential information processors and completed the study by learning to juggle with either whole or part teaching methods. Using the two way analysis of variance in a two by two factorial design, a significant interaction effect was found. ($F$ (1,96) = 6.02, $p < .05$). Sequential learners using the part method and holistic learners using the whole method took significantly fewer minutes to learn to juggle than sequential learners using the whole method and holistic learners using the part method. Learning efficiency was increased by implementing appropriate instructional strategies to meet the unique needs of the individual learner.

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March 17, 1979
3:00 pm

**THE LEARNING OF TENNIS SKILLS AS INFLUENCED BY A KNOWLEDGE OF MECHANICAL PRINCIPLES.** Larry A. Good, Victoria A. LeFevers, Dennis Golden, Southern Illinois University-Carbondale; John Perry, Mississippi Valley State College.

The purpose of the study was to determine if there was a difference in the acquisition of tennis skills between subjects taught by two different methods of instruction. Forty randomly selected college students from two beginning tennis classes were divided into two groups: (1) the control group was instructed by the traditional method and received a thorough analysis of each stroke; (2) the experimental group also received a thorough analysis of each stroke, but it was supplemented by an introduction to mechanical principles and how they apply to the tennis strokes. Both groups were taught by the same team of four instructors and received handout materials explaining stroke techniques. The experimental group's material was identical in context to that of the control group except that following each statement on technique was a series of letters and numbers corresponding to a list of mechanical principles on another sheet not given to the control group. The two groups were tested at the beginning and the end of the course on skills (forehand and backhand) and knowledge of rules, strategy, technique, and mechanical principles. Students were also tested on ability to transfer knowledge from the forehand stroke to the backhand stroke and on a skill test measuring transfer from tennis to racketball. Multiple linear regression analysis was used to determine if significant differences occurred between the two groups on forehand skill, backhand skill, tennis knowledge, understanding of stroke analysis and application of mechanical principles, and skill transfer to racketball. The experimental group scored significantly higher than did the control group at the assigned .05 level on knowledge of techniques, velocity, mechanics, and knowledge of transfer from forehand to backhand on techniques and mechanics. There were no significant differences between groups on skill test scores or on transfer scores from tennis to racketball. It was concluded that in beginning tennis students, the introduction of mechanical principles and their application to the tennis strokes had no significant effect upon the skill test scores of the students; however, the introduction to mechanical principles did cause significant differences between groups in the knowledge of techniques, velocity, mechanics, and transfer techniques and mechanics from forehand to backhand.

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**March 17, 1979**
**3:15 pm**

# A COMPARISON OF TWO FOREARM PASS SERVE RECEPTION METHODS IN VOLLEYBALL.

**Richard H. Cox, Kansas State University.**

The purpose of this investigation was to study the relationship between two forearm passing methods (straight arm and elbow snap) and serve reception performance in volleyball. Fifty-eight beginning to intermediate college age volleyball students (34 female and 24 male) were initially assigned to either a straight arm or elbow snap training condition. The subjects were assigned to their respective training conditions on the basis of matched-pair scores on the Brumbach forearm pass wall-volley test. Variance analysis on the Brumbach test scores for the male and female subjects verified that the two conditions were equal in terms of initial passing ability. After 11 weeks of training (twenty-two 40-minute class sessions) subjects were again tested on the Brumbach wall-volley test and also on the Cox serve reception text. Two 2 (condition) x 2 (sex) factorial designs were used to analyze the data. In the first analysis, the final Brumbach scores served as the dependent variable, while the second, the Cox test scores did. The results of the analysis showed that reliable differences do not exist between the two forearm pass methods in terms of serve reception performance (as measured by the Brumbach and Cox tests). In addition, the males out-performed the females (across conditions) when performance was measured by the Brumbach test, but not when measured by the Cox test. In terms of learning, it was noted through separate variance analyses that both sexes and groups significantly improved on forearm passing ability as measured by the Brumbach test (comparison of initial and final scores). From the results of this investigation it may be concluded that: a) a relationship does not exist between forearm passing performance and the two passing methods; and b) both methods of forearm passing (straight arm and elbow snap) result in improved forearm passing ability as a result of training.

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March 17, 1979
3:30 pm

**RATINGS OF PERCEIVED EXERTION, SELF-CONCEPT, AND BODY CATHEXIS OF THE FEMALE ATHLETE. Pamela A. Robinson, University of North Carolina at Chapel Hill and Mary Allen Watson, North Carolina State University.**

The purposes of this study were: (a) to determine ratings of perceived exertion during exercise of college-age female athletes, (b) to determine the relationships of heart rate, oxygen consumption, and ventilation to the ratings of perceived exertion, and (c) to investigate the relationships of self-concept and body cathexis to perceived exertion. Eleven female intercollegiate athletes volunteered to participate in the study. The subjects performed six maximal oxygen consumption tests on a treadmill at varying speeds and elevations. Three of the tests involved continuous loading and three discontinuous loading performed at a 2:1 work-to-relief ratio. The following measurements were determined: resting, exercise, and recovery heart rates, oxygen consumption, pulmonary ventilation, and ratings of perceived exertion. The psychological evaluations were administered to the subjects during the second week of the testing program. Bill's Index of Adjustment and Values and Secord and Jourard's Body-Cathexis Scale were administered to measure self-concept and body cathexis, respectively. An analysis of the data revealed high positive relationships between RPE to HR and RPE to $\dot{V}e$ and a Moderate RPE to $\dot{V}O2$ correlation. The combination of the three physiological variables exhibited a moderate to high influence on the RPE, with HR and $\dot{V}e$ making the greatest contribution. An analysis of the scores obtained from the Index of Adjustment and Values and the Body Cathexis Scale, when ranked and compared to the ratings of perceived exertion, revealed independent relationships between the self-concept and body cathexis scores in relation to the RPE values. Within the limits of the population studied and the design of the investigation, the following conclusions were made: a combination of the three physiological variables studied (HR, $\dot{V}e$, $\dot{V}O2$) had a moderate to high influence on the ratings of perceived exertion; performance of continuous exercise yielded greater accuracy in perception of exertion than discontinuous; and a subject's concept of self and degree of satisfaction toward herself and her body (body cathexis) had relatively little influence on her perception of exertion.

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March 17, 1979
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Poster #1

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## DETERMINANTS OF PREFERENCES FOR SOCIAL vs. NON-SOCIAL EVALUATION OF MOTOR SKILLS.

William T. Weinberg, Ph.D., University of Louisville, Louisville, Kentucky.

The purpose of this study was to examine several factors that affect preferences for selecting social or non-social methods for evaluating motor skills. The participants were 200 male college students enrolled in handball or racquetball classes. Factors included as determinants of preferences for social or non-social evaluation of handball and/or racquetball skills consisted of, (1) rated level of ability (assessed at beginning and end of semester by a 9 point graphic rating scale), (2) inclination to approach or avoid social interactions (assessed by the Social Avoidance and Distress scale (SAD)) and, (3) inclination to become nervous in evaluative settings (assessed by the Fear of Negative Evaluation scale (FNE)). The degree of importance attached to the possession of these skills was also assessed. Preference for type of evaluation was ascertained by requesting participants to select whether they would prefer that a portion of their course evaluation be based on tournament participation (final score consisting of the number of games won and instructors' subjective ratings of their ability), or valid skill tests administered individually by the instructors.

The pertinent results may be summarized as follows:

1. Preference for social, as opposed to non-social evaluation was greatest for persons who rated their ability as "average" or "intermediate", ($p < .05$).
2. Persons who rated their ability as being either extremely high or extremely low demonstrated a clear preference for non-social evaluation, ($p < .01$).
3. When persons indicated that the results of their performance were of minimal importance, all ability levels selected social methods of evaluation as opposed to non-social evaluation.
4. Although persons scoring high or low on the SAD and FNE expressed diverse estimates of anticipated discomfort and/or satisfaction associated with each method of evaluation, their scores were unrelated to type of evaluation actually selected.

It was concluded that perceived ability, rather than individual differences in expressed fears of social interaction and negative evaluation was the most important determinant in the selection of evaluation method.

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March 17, 1979
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Poster #2

**PSYCHOPHYSIOLOGICAL AROUSAL CONCOMITANT TO TYPE-A BEHAVIOR PATTERN.** Richard A. Fee, Ph.D. University of Louisville, Louisville, Kentucky.

The objective of this study was to explore possible psychophysiological differences between individuals exhibiting high or low Type-A behavior pattern (coronary prone behavior pattern), specifically with respect to anxiety, resting muscle tension, EEG frequency, and skin conductance. Twenty eight adult subjects were requested to relax in a comfortable semi-supine position while baseline measures of muscle tension, EEG frequency, and skin conductance were collected over a 300 second interval. All measures were recorded following stabilization of muscle tension levels. EMG (muscle tension) was collected from the frontalis muscle, EEG frequency was measured from the left occiput ($O_1$), (unipolar) and skin conductance was measured on the nondominant hand. Prior to physiological measurement, Type-A behavior pattern and state/trait anxiety were assessed via the Jenkin's Activity Survey and the State Trait Anxiety Inventory, respectively. Following the measures, subjects were divided into two groups (high Type-A behavior pattern score and low Type-A behavior pattern score) on the basis of the Jenkin's Activity Survey (JAS) and the data were analyzed. The results of the study indicated that those subjects who scored high on the JAS (over 12 points) exhibited significantly higher muscle tension (3.225 microvolts vs 2.145 microvolts) and higher EEG frequency (10.35 hz vs 9.5 hz) than those who scored low (less than 8 points) on the JAS. There was no significant difference between the groups with respect to state anxiety, trait anxiety or skin conductance. It was concluded that those individuals who exhibited Type-A behavior pattern manifested physiological arousal in muscular and central nervous systems in addition to that commonly reported in the cardiovascular system.

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March 17, 1979
3:00-5:00 pm
Poster #3

SPORT AND PSYCHOPHYSICAL HEALTH: A STUDY OF PERCEPTIONS AND INVOLVEMENT. Stephen J. Grove, Oklahoma State University; Diana McConahy, Oklahoma State University; Richard A. Dodder, Oklahoma State University.

This study was concerned with the extent to which a sample of students and faculty endorsed sport activities as performing positive contributions to individuals' physical and psychological well-being. Utilizing the questionnaire method of research, responses were gathered from 637 diverse students (N=510) and faculty members (N=127) at Oklahoma State University. The 28 items on the questionnaire designed to measure perceptions of several possible functions of sport were factor analyzed. The five items which loaded on a factor labeled Psychophysical Health were: (1) Involvement in sports is bad for my emotional health; (2) Sports make me feel lonely; (3) Involvement in sports helps people to improve their health; (4) Sports do more harm physically than they do good; and (5) Sports are poor public entertainment. These Likert-type items were followed by seven-point continua ranging from strongly agree to strongly disagree and scaled by summation. The responses of the sample were compared by student-faculty status and sex, as well as by degree of participation, attendance, and an overall index of involvement with sports. The results indicated that students perceived sports as providing a greater contribution to psychophysical health than faculty; and females indicated a greater contribution than males. In addition, those who participated in sports more, who attended sport activities more, and who were involved generally in sports to a greater degree indicated greater contributions from sport. These differences by involvement were found to be consistent, with few exceptions, across the student-faculty and sex variables. The results of this research indicated an overall endorsement of sports as providing psychophysical health. Involvement in sport, particularly active participation, seemed to have the greatest impact on this endorsement.

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3:00-5:00 pm
Poster #4

## A COMPARISON OF FOUR PROCEDURES FOR ACQUIRING SPECIFIC TEACHING BEHAVIORS IN PRESERVICE HEALTH METHODS CLASSES.

Karen King, University of North Carolina at Greensboro.

The purpose of this study was to determine whether any of the following instructional strategies would influence a significant gain score in the frequencies of three specifically defined teaching behaviors performed by preservice teachers majoring in elementary or early childhood education: (1) modeling in combination with videotaped self-evaluation; (2) modeling; (3) viedotaped self-evaluation; and (4) a traditional teaching style. Eighty-four female students enrolled in four sections of a five-week long Elementary Health Education Methods course were subjects in this pre-test post-test study. Trained observers independently evaluated the pre and post six-minute micro-lessons. Observation was considered completed when the disparity between observers on any one behavior was one or zero. Of the 546 individual instances, this objective was met on the initial observation for 405 cases. Of the 16 instances where disparity was two or more, agreement was reached in the second observation. Mean gain scores within groups were analyzed by using multiple t-tests (p .005). The only significant gain scores were on redirection and general praise for both the modeling-alone group and the combined group. Paraphrasing realized a significant change among members in the combined group, while redirection significantly improved for the videotaped self-evaluation group. No significant gains were reported for the traditional group. Multivariate F-tests (p..05) analyzing for among group differences demonstrated that no one instructional style made more of an input than another. The findings of this study support the theoretical and empirical contention that modeling in combination with instructions and feedback can be used to help preservice teachers acquire specific teaching behaviors.

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March 17, 1979
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Poster #5

# A FACTOR ANALYTIC APPROACH TO EXPLORATION OF ATTITUDES TOWARD PREMARITAL SEX AMONG UNMARRIED COLLEGE STUDENTS.

**Mark B. Dignan, The University of North Carolina at Greensboro; David J. Anspaugh, Memphis State University.**

Responses from 720 never married students from three State Universities in the Southeastern U.S. were factor analyzed to determine structures of correlations with attitudes toward premarital sex. The respondents completed an instrument containing Reiss's Permissive Attitude Scale, a section designed to assess socioeconomic status and general family background, and a section concerned with sexual activity. Principal factor analysis without iteration yielded the following factor structure, with 75% of the variance accounted for after rotation. Factor 1 - sexual intercourse within the past year, number of episodes of sexual intercourse within the past year, and number of episodes of sexual intercourse per week. Factor 2 - father's religious preference, mother's religious preference, and subject's religious preference. Factor 3 - father's education, annual family income, and father's occupation. Factor 4 - frequency of subject's church attendance, subject's age at first sexual intercourse, and subject's age at first oral sex. Based on the nature of the variables loaded, Factor 1 was termed premarital sexual activity, Factor 2 religiosity, Factor 3 socioeconomic status, and Factor 4 was termed moral background versus age at initiation to sexual activity. Factor scores were generated for each observation using the factor loadings as weightings. Results from Reiss's Permissive Attitude Scale were collapsed into three categories of attitudes toward premarital sexual permissiveness (N=377, 113, 230). Each of the categories of attitudes were then used as controlling variables for exploration of determinants of the factor scores. Factor scores by permissive attitude category were statistically distinct ($p < .01$), with high permissive greater than medium permissive greater than low permissive. The three permissiveness groups were found to be distinguishable in terms of the subjects' age (older subjects tend to score higher), race (Whites factor scores were higher than Blacks, overall), and mother's occupational status (less professional occupational status correlated with higher factor scores). The medium permissive category exhibited the most conservative pattern of premarital sexual behavior. Differences in attitudes toward premarital sexual activity are explicable in terms of a structure of experiential, familial, and sociological attributes. These attributes appear to be connected by a matrix of other variables including age, race, and parental occupational status.

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March 17, 1979
3:00-5:00 pm
Poster #6

# CHANGING MOVEMENT BEHAVIORS OF YOUNG HANDICAPPED CHILDREN THROUGH STRUCTURED MOVEMENT LEARNING OPPORTUNITIES.

Rebecca I. Reber, Texas Woman's University; Claudine Sherrill, Texas Woman's University.

The purpose of this study was to change selected movement and social behaviors of young handicapped children through exposure to a 10-week movement program based upon individualized education programming (IEP) procedures as outlined in Public Law 94-142. The 15 subjects, whose ages ranged from 2-15, came from two facilities: a community based outreach center for developmental delays and a regional deaf education public school program. Handicapping conditions included cerebral palsy, mental retardation, deafness, hearing impairment, and various undifferentiated developmental delays. Some children were nonambulatory and/or nonverbal. Pre, post, and continuous interim testing was based upon Texas Woman's University adaptations and expansions of the Santa Cruz Behavioral Characteristics Progression (BCP). Individualized educational programming based upon repeated measures diagnostic/prescriptive testing was implemented by an interdisciplinary team of graduate students and faculty in the fields of physical education, dance, music therapy, therapeutic recreation, and occupational therapy. The experimental movement program emphasized a blend of early childhood dance, music, and relaxation activities which were recorded so that the program can be replicated. Findings based upon nonparametric analysis of TWU/BCP data and periodic videotapes revealed significant improvements in movement and social behaviors of young handicapped children, ages 2-10. Success of the program was attributed to interaction of several factors: (1) the individualized educational program diagnostic/prescriptive approach; (2) the movement program itself; and (3) the interdisciplinary team facilitation of research objectives. It was concluded that the early childhood IEP movement experiment was a viable, replicable program for changing movement and social behaviors of young handicapped children. Since P.L. 94-142 requires free appropriate public school education for handicapped children, ages 3-5, the replicable movement program was believed timely.

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March 17, 1979
3:00-5:00 pm
Poster #7

## A COMPARISON OF SELECTED BASIC GROSS MOTOR SKILLS OF MODERATELY RETARDED AND NORMAL CHILDREN OF MIDDLECHILDHOOD AGE UTILIZING THE OHIO STATE UNIVERSITY SCALE OF INTRA GROSS MOTOR ASSESSMENT.

**Terrence M. Ryan, The Ohio State University.**

The investigation attempted to distinguish the qualitative differences in performance between mentally retarded and normal children in the execution of the skills of walking, running, hopping, throwing, catching, jumping, kicking, striking, skipping, ladder climbing, and stair climbing. The skills examined by the O.S.U. SIGMA are subdivided into four observable levels of motor performance ranging from the least mature level of performance to the most mature functional level of performance. One hundred and twenty moderately retarded children between the ages of six to eight and with I. Q.'s ranging from twenty to fifty-three were selected from seven schools in the Sate of Ohio. An equal number of children with normal intelligence and ages between six to eight were chosen for comparison purposes from a public school in Columbus, Ohio. Each of the children were assessed individually and their performances compared to the stated criteria for each skill as defined in the O.S.U. SIGMA to determine the predominant motoric behaviors they exhibited. Data obtained from the assessment procedures were graphed to provide a descriptive profile of the mentally retarded and normal childrens' performance in each skill. Results clearly demonstrated the basic gross motor skill performance of moderately mentally retarded children to be significantly less developed than that of normal children when compared on a qualitative basis. In only one skill, namely walking, did results indicate a similar level of performance between normal and mentally retarded children. In the remaining ten skills, very low levels of performance were generally noted in the retarded population. The mentally retarded childrens' least mature performances were in the fairly complex skills of skipping, hopping and catching. Kicking, striking, throwing, and ladder climbing performances were also at a strikingly low functional level.

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March 17, 1979
3:00-5:00 pm
Poster #8

## NEEDS OF PHYSICAL EDUCATORS FOR TEACHING EXCEPTIONAL POPULATIONS*

W. Liemohn, University of Tennessee; G. Goodwin, Indiana University Developmental Training Center; R. Carlson, Indiana University; and K. Nordholm, Indiana State Board of Health.

The purpose of this study was to determine perceived needs of physical education teachers relative to providing services for exceptional populations in the public schools. To ascertain these perceived needs, a Likert-type scale questionnaire was constructed to determine needs as they relate to 1) general information (e.g., cause of exceptionality, motor ability and behavior expectations), 2) teaching ideas (e.g., for intact special education classes and for special education children who have been mainstreamed), and 3) instructional materials (e.g., curricula and bibliography). Since there was another section to this survey, an important overriding goal to facilitate receiving respondent cooperation was to keep the entire instrument short enough so that an individual could complete it in less than seven minutes. Questionnaires were then sent to all of the 3,424 licensed physical education teachers in Indiana; 1,727 questionnaires were returned for a return of 50.4%. Males responded at a rate of 46.5% (54.5% of the returns); females responded at a rate of 55.1% (45.5% of the returns). Other demographic data which might have tenored responses include: 1) a greater percentage of the males had coaching assignments, 2) a greater percentage of those not assigned coaching responsibilities were in larger school districts, and 3) a greater percentage of the more experienced teachers were males. The conclusions derived from the crosstabulation analysis include: 1) positive relationship was generally seen between school district size and the need for information on working with exceptional children, particularly behavior management techniques, 2) the respondents' number of years of teaching experience had less effect on response than anticipated, and 3) female respondents' perceived needs were greater than those of males. Following the determination of the most descript demographic classificatory variables, ANOVA was used to examine the data further. Although this analysis resulted in mixed findings, it illuminated the fact that female perceived needs were significantly greater than male perceived needs on all 11 questions ($\underline{P} = .01$).

*This study was supported by Indiana University Developmental Training Center and Indiana State Department of Health.

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**March 17, 1979
3:00-5:00 pm
Poster #9**

# SIMILARITIES IN MOTOR PERFORMANCE BY MENTALLY RETARDED CHILDREN AND INTELLECTUALLY NORMAL CHILDREN OF EQUAL MENTAL AGE.

Gail M. Dummer, University of Maryland, College Park.

Two experiments were designed to test the hypothesis that mentally retarded and intellectually normal children of equal mental age will perform similarly on motor learning tasks which involve information processing abilities. Underlying this hypothesis were the assumptions that equal mental aged retarded and normal children possess similar information processing abilities, and that information processing abilities are important in the acquisition and performance of motor skills. In Experiment 1, 72 trainable mentally retarded children aged 9-16 were randomly assigned to one of six experimental groups. One group was a variable practice group, four were constant practice groups, and one group served as a control. Each group except the control group received 80 practice trials on a force production task in which subjects propelled a toy car along a metal rod track to designated target positions. All groups then participated in 40 transfer trials involving novel target positions. The performances of retarded children on this task were compared with data from a similar investigation of normal preschool children (Kelso and Norman, Developmental Psychology, 1978, 14, 153-156). These comparisons revealed marked similarities in the mean performances of these normal and retarded children. In Experiment 2, 39 trainable mentally retarded children and 30 normal preschoolers of equal mental age were randomly assigned to instruction, no instruction, or control groups. The instruction and no instruction groups each received 80 practice trials on a ball rolling-target game, during which the instruction group received advice on task solutions. Following the practice trials, all three groups participated in 40 transfer trials on a similar but not identical task. Nonparametric comparisons of the preschool and retarded groups indicated similar performances by these groups on this task. The results of both experiments indicate support for a developmental age construct of motor behavior. Potential applications of a developmental age construct will be discussed.

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March 17, 1979
3:00-5:00 pm
Poster #10

## AN ANTHROPOMETRIC COMPARISON OF CLASSICAL AND MODERN DANCERS AT THREE LEVELS OF TRAINING.

Nancy Zelonka; Margaret Skrinar, University of Pittsburgh.

As part of a larger study, this research described the anthropometric characteristics of modern and classical dancers at beginning, non-professional, and professional levels. Sixty-five adult subjects, thirty-six modern dancers and twenty-nine classical, were tested in Pittsburgh and New York. Measures were taken on standing individuals, and where relevant, on the right side. Those measures included height, weight, girth of the waist, hip (at the iliac crest), chest (normal expansion), thigh and calf (at the maximum points). Breadth measures, taken with the Behnke stick, were at the shoulder (bi-acromial), hip (iliac crest), lower hip (bitrochanteric), and wrists and ankles (at the minimum point). Chest girth (at the xyphoid process) was taken with a Vernier Caliper. Length of body segments were taken for the arm (acromial process to the distal end of the humerus), lower arm (distal end of the humerus to the ulnar carpal joint), upper trunk (from the crown to the pubis), thigh (pubis to the inferior border of the knee cap), and lower leg (inferior border of the knee cap to the distal end of the fibula). Detailed measurement results were presented as means, standard deviations, and standard errors in tabular and graph form. Generally, it appeared that the distinction between classical and modern dancers was in body proportion. The professional classical dancer was more evenly proportioned with regards to the body segment lengths than all other groups. The professional modern dancer seemed to reflect a young American adult physique which is typically unevenly proportioned. The primary girth measurement distinction was between professional and non-professional/beginners at the waist and lower hip. The professionals were smaller at these points than the others. Aesthetically there are certain body types more appropriate to a dance form and to the professional level. Determination, through descriptive investigation, of what anthropometrically constitutes this aesthetic entity can assist in guiding students in the selection of a particular dance form.

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March 17, 1979
3:00-5:00 pm
Poster #11

# FIVE FITNESS CHARACTERISTICS OF CLASSICAL AND MODERN DANCERS AT THREE LEVELS OF TRAINING.

Margaret Skrinar, University of Pittsburgh; Nancy H. Zelonka, University of Pittsburgh.

Little is known about the developmental effects of dance training on fitness. This research describes five selected fitness characteristics of classical and modern dancers at varying levels. Sixty five adult volunteers fell into one of five groups according to their type and level of dance preparation: professional members of an NEA Touring Program ballet company (PCD, 9 females, 6 males); professional members of two NEA Touring Program modern companies (PMD, 8 females, 3 males); non-professional intermediate modern dancers dancing 15-25 hours per week (NPMD, 13 females); beginning classical students (BCD, 14 females); and beginning modern students (BMD, 12 females). Subjects' resting heart rate, blood pressure, grip strength, predicted fat percent and predicted MAX $VO_2$ were measured. NPMD, PMD, and PCD mean resting heart rates were 14-18 beats below BMD and BCD. All mean blood pressures were within the normal range. Mean grip strength measures were 7.2-1.4 lbs. below the respective male and female population means. Female fat percent group means were 5%-9% leaner than the population mean while mean male scores were no different than the population mean. A six minute bicycle test revealed that females in NPMD (55.5 ml/kg/min), PMD (52.4 ml/kg/min) and PCD (60.3 ml/kg/min) scored higher than males in PMD (51.2 ml/kg/min) and PCD (51.5 ml/kg/min). The professional male dancers were generally of average fitness while non-professional and professional females tended to be highly fit. As expected, beginning female dancers are less fit than professional and non-professional dancers. Further research with a larger N, more male dancers in all groups, and direct measurement of maximum oxygen intake is necessary in order to examine whether; 1) female dancers are comparably more fit than males; and 2) the Astrand bicycle test may be biased in favor of fit females.

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March 17, 1979
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Poster #12

THE METABOLIC COST OF BALLROOM DANCING. Carole L. Goldberg and J.E. Misner, Physical Fitness Research Laboratory, University of Illinois at Urbana-Champaign.

The primary purpose of this study was to determine the metabolic cost of ballroom dancing. Secondly, the study described the cardiovascular stress associated with particular types of dances. Six college-aged volunteers (3 male and 3 female) served as subjects. Each was given a walking treadmill test to determine maximal oxygen consumption and maximal heart rate. The subjects also participated in two dance testing sessions. In order to determine the oxygen cost of dancing, a Kofranyi-Michaelis respirometer was used to measure ventilation and to collect .06% samples of expired air. These gas samples were then analyzed for $O_2$ and $CO_2$ content. Simultaneously, heart rates were monitored by telemetry twice every minute during the session. Each dance session consisted of a mixed order of twelve dances, two of each of the following: waltz, foxtrot, rhumba, cha-cha, swing, and polka. Each individual dance lasted 2 1/2 minutes followed by a 30 second rest for a total of 36 minutes. Recovery gas samples were collected for 15-20 minutes at the end of each session. The women used 5.4 Kcal/minute and the men used 6.7 Kcal/minute. These values represented 44.0% and 39.1% of maximum metabolic capacity, respectively. The mean heart rates expressed in terms of a percentage of maximum heart rate for the six dances were as follows: Rhumba - 37%, Foxtrot - 43.9%, Waltz - 43.9%, Swing - 51.7%, Cha-Cha - 53.4%, and Polka - 55.1%. On the basis of these results it was concluded that ballroom dance is a medium intensity activity, falling short of the accepted threshold level for cardio-respiratory training but may be useful in rehabilitation or as an aid in weight control.

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March 17, 1979
3:00-5:00 pm
Poster #13

PLAYGROUND ACTIVITY LEVELS AMONG CHILDREN: TRADITIONAL VERSUS CREATIVE PLAYAREA. Carl Gabbard, Texas A&M University.

The purposes of this investigation were to (1) investigate playground apparatus activity levels for children in grades K-4, and (2) compare activity levels between a traditional and creative playground. One intact class from each grade level (n=111) participated in the study. Each intact group was allowed twenty minutes of playground time per day (5 days) on each playarea (which was located at the experimental site). Subjects were allowed to play as they wished, with balls and ropes available if requested. The analysis of playground activity was performed using a piloted assessment instrument which recorded contact with playarea apparatus. Activity levels within each group were compared using creative and traditional activity scores and t-tests. The creative playarea was not new to the grades 1-4 subjects, it was constructed three years prior to the experiment. Statistical analysis revealed that activity levels were significantly higher on the creative playarea for the kindergarten, third and fourth grade groups ($p$ <.001). Activity levels were also higher among first and second grade groups but not at the pre-determined level of significance ($p$ > .05). Analysis also revealed that after the second grade year, play activity on traditional apparatus decreased at increasing rates. It can be concluded that the creative playground area did produce higher activity levels, especially for third and fourth grade groups. It was also shown that intermediate grade activity was equal to primary grade activity on the creative apparatus, this was not revealed after traditional activity analysis.

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**March 17, 1979**
**3:00-5:00 pm**
**Poster #14**

**A NATIONWIDE STUDY EXPLAINING THE PUBLIC RELATIONS BEHAVIOR OF PUBLIC SCHOOL PHYSICAL EDUCATION ADMINISTRATORS.** Freeman Miller, Department of Physical Education University of Maryland.

The purpose of this study was to determine under what conditions public school physical education administrators would engage in public relations. A mail questionnaire was administered to a national sample of 689 individuals, Communication literature and organizational literature were reviewed along with measures of professionalism to observe how organizational structure, professional index and public relations activities affect communication behavior. Organization structural variables and communication variables were related to Grunig's Multi-Systems Theory of Communication, a situational model of communication. Three types of communication situations were identified about which four identified types of administrators were most likely to communicate. Two types of school system structure were identified which explained the communication behavior of three administrator types and administrative philosophy the fourth. It was concluded that public school physical education administrators generally do not engage in public relations, school system structure can explain some communication behavior and administrative philosophy explains others, and professionalism was positively related to public relations behavior of these administrators.

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March 17, 1979
3:00-5:00 pm
Poster #15

# PREDICTION OF BODY DENSITY, LEAN BODY WEIGHT, AND PERCENTAGE BODY FAT FROM ANTHROPOMETRIC MEASURES ON NINE AND TEN-YEAR-OLD GIRLS.

Linda Youngberg, Oklahoma State University: Scarlet Johnson, Oral Roberts University: James Schwane, Oral Roberts University: A.B. Harrison, Oklahoma State University

The purposes of this investigation were to: (1) develop prediction equations for body density (BD), lean body weight (LBW), and percentage body fat (PBF) from anthropometric measures on a random sample of 51 fifth grade Caucasian girls ($\bar{X}$=10.7 yrs) attending a suburban elementary school in Oklahoma; (2) cross-validate these equations on an additional sample of 31 volunteer fourth and fifth grade females ($\bar{X}$=10.2 yrs) from the same school district. In phase one of this study, the following anthropometric measurements were taken on each of the participants by a skilled technician: height, weight, 8 skinfolds, 11 circumferences, and 7 skeletal measures. BD was determined by the underwater weighing process with residual volume measured in air during a previous testing session. Criterion values for LBW and PBF were derived from the Brozek formula. Mean values and standard deviations for the criterion variables were: BD= 1.053 ± .0168 g/ml; LBW= 59.12 ± 6.65 lbs; PBF= 19.54 ± 6.89%. The data were submitted to multiple regression analysis with the laboratory-determined BD, LBW, and PBF functioning as dependent variables in their respective equations and the anthropometric measures as independent variables. This analysis yielded the following prediction equations:

BD= -.0007856 (sum in mm of midaxillary, abdominal, and suprailiac skinfolds) + 1.085 R= .88 SE= .008 g/ml
PBF= .3274 (sum in mm of midaxillary, abdominal, and suprailiac skinfolds) + 6.66 R= .88 SE= 3.31%
LBW= 0.7480 (weight in lbs) - 0.5645 (midaxillary skinfold in mm) - 0.2795 (suprailiac skinfold in mm) + 12.605 R= .93 SE= 2.44 lbs

In phase two of this investigation, the above equations were utilized to predict BD, LBW, and PBF on the cross-validation sample. Pearson product-moment correlation coefficients were computed between the predicted values as derived from the regression equations and the criterion variables as determined from underwater weighing. This analysis yielded the following validity coefficients and standard errors for each formula: BD, r= .83 SE= .0059 g/ml; PBF, r= .83 SE= 2.43%; LBW, r= .93 SE= 1.49 lbs. Thus, validity was established.

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March 17, 1979
4:00 pm

# THE EFFECTS OF AGE AND SEX ON BODY BUILD IN CHILDREN.

Barbara Campaigne, Patty Freedson, Thomas Gilliam, and Victor Katch. The University of Michigan, Ann Arbor, MI.

It was the purpose of this study to determine sex differences in body build of children, with the effects of age held statistically constant. Body composition determined hydrostatically and corrected for residual lung volume was obtained on 180 healthy male and female children ages 6-14 years. Standard anthropometric measurements (diameters and circumferences) were also obtained on all subjects. An analysis of covariance (ANCOVA), with age as the covariate, revealed no significant differences between the sexes for ratio scores when comparing diameters of lower extremity to lower trunk; specifically, knee to bitrochanter, knee to biiliac, ankle to bitrochanter, and ankle to biiliac. Similarly, no significant differences were shown between males and females in ratios of upper extremity to upper trunk diameters, which included elbow to biacromial, elbow to bideltoid, wrist to biacromial, and wrist to bideltoid. A significant difference ($P < .05$) (ANCOVA) was found between male and female children for the ratio of fat weight to lean body weight (.18 vs .23, respectively). It was concluded that no differences in body structure of males and females, as determined anthropometrically are present after the effects of age are removed. However, there is an apparent sex difference in fat weight and lean body weight components of children.

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March 17, 1979
4:15 pm

**INTERINVESTIGATOR RELIABILITY OF SKINFOLDS.** T.G. Lohman, University of Illinois at Urbana-Champaign; J.H. Wilmore, University of Arizona; F. Roby, University of Arizona and B.H. Massey, University of Illinois at Urbana-Champaign.

This study was designed to compare interinvestigator error in measurement of selected skinfold sites based on two standardization procedures. For the first procedure, three experienced investigators each measured thirteen subjects for three trials at each of six skinfold sites (triceps, subscapula, abdomen, suprailiac, waist and thigh). The investigators followed written instructions on the anatomical locations of each site, but did not confer on the exact measurement technique used. For the second procedure, the investigators each measured thirteen subjects, two trials at each of three sites, after conferring regarding technique and after each site had been marked by one investigator. In addition, triceps skinfold was measured by each investigator 2.5 cm proximal, distal, medially and laterally to the midpoint of the upper arm. It was hypothesized that substantial differences in skinfolds at a given site are associated with interinvestigator error and that standardization of site location and technique will reduce measurement error. Under the first procedure, the mean differences between any two investigators ranged from 0.3 mm for the triceps to 11.2 mm for suprailiac. The interinvestigator error in decreasing order was: suprailiac (5.9 mm), waist (3.2 mm), abdomen (2.7 mm), thigh (2.5 mm), subscapular (2.1 mm) and triceps (1.7 mm). For the second procedure the mean differences among investigators were found to decrease substantially. The interinvestigator errors were less, also, for the three marked sites studied: suprailiac (1.8 mm), abdomen (0.9 mm) and triceps (1.0 mm). The mean triceps for all three investigators changed as much as 4.1 mm by varying the location 2.5 cm from the midpoint of the upper arm. Under the first procedure the use of two skinfolds (triceps and abdomen) resulted in a difference of 2.9% body fat between the two investigators that differed the most for those sites. Under the second procedure the difference was reduced to 0.5% fat. It was concluded that substantial differences among experienced investigators could be reduced by standardization procedures including markings of sites and the use of similar skinfold measurement technique.

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March 17, 1979
4:30 pm

**LEISURE TIME PHYSICAL ACTIVITY AND JOB PERFORMANCE.*** Steven N. Blair, Russel R. Pate, Morton Rosenberg, University of South Carolina; Henry G. Howe, Gwynne M. Parker, Liberty Corporation.

Many benefits are claimed for regular physical activity. In recent years many business concerns have implemented phsical fitness programs for employees. Implicit in this activity is the assumption that the program will benefit the company as well as the employee. There is apparently a general impression that the physically fit worker is more productive, however, little data can be found to support this position. The purpose of this investigation was to examine the relationships between regular physical activity and selected measures of productivity. Headquarters employees (n=504) of Liberty Corporation in Greenville, S.C., participated in an employee health evaluation. A medical examination was administered along with an extensive questionnaire on health habits, attitudes, and knowledge. Data on absenteeism and employee productivity were obtained from the company personnel office. A comprehensive leisure time physical activity questionnaire provided a reported physical activity index (PAI). Personnel data analyzed for this report were sick leave hours (SLH), supervisor's rating (SR), and merit pay % increase (MERITPC). Correlational analyses revealed several significant relationships between PAI and the personnel data. After adjustment for age, sex, and race only two significant results were obtained. Black women classified by three levels of PAI were significantly different on the SLH variable. White women similarly classified were found to differ on SR. We found no significant relationships among the variables studied for white men. There were too few black men to permit any analyses. Black women reporting a moderate PAI had more SLH than those reporting low or high PAI. White women reporting higher PAI received higher SR. No other effects of reported PAI were noted. Leisure time physical activity did not show consistent effects on employee absenteeism and/or productivity.

*This study was supported by funds from Liberty Corporation and the Stanford University Lipid Research Clinic program (NHLBI contract N01 H1 1-2161-L).

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March 17, 1979
4:45 pm

# PHYSIOLOGICAL RESPONSES OF SENIOR ADULTS RUNNING A FIT TRAIL[a]

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Heart rates were monitored continuously while 51 men and women ranging in age from 22-72 walked or jogged a modified parcour fit trail. Subjects were required to have a treadmill stress test prior to participation. The length of the course, its gradient, distance between stations and elevation of the course were measured. Mean % max HR (Karvonen) values were submitted to a two-factor ANOV mixed design to compare HR to and at each station by sex and age. Results indicated some significant interaction effects. Women generally performed at a higher % max HR than men. Older subjects experienced potential training effects while younger subjects were not always challenged. Desired max output was exceeded in some cases. The results supported modification and use of fit trails for senior adults as a means of achieving cardiovascular fitness training effects which are perceived by participants as beneficial and offer an alternative fitness regimen.

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[a] This research was supported by funds from the Developmental Grant Program of the Gerontology Center, The Pennsylvania State University; supported in part by the Administration of Aging, Department of Health, Education and Welfare under Title IV-C of the Older Americans Act.

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March 17, 1979
5:00 pm

THE FACTOR ANALYTIC STRUCTURE OF THE TWELVE MINUTE CRAWL STROKE SWIM. Allen Jackson, North Texas State University; A.S. Jackson, University of Houston; Ronald Frankiewicz, University of Houston.

This research sought to examine the twelve minute crawl stroke as a multivariate measure of aerobic endurance in swimming in an exploratory manner. An underlying performance structure was conjectured that might include initial sprint, stability of pace, and re-acceleration of swimming speed. This study's goal was to not only verify this structure but more importantly, to quantify this structure. Forty-two swimmers of intermediate to advanced levels of swimming ability were administered the twelve minute crawl stroke swim for distance. The distances covered in each minute along with the total distance was recorded for each subject. Cannonical factor analysis with orthogonal and oblique rotations was applied to the twelve separate minute distances in order to isolate and identify the factors that make up a total performance structure. The analysis revealed two factors. The first factor was characterized by high pattern coefficients (.591 to .804) for minutes four to twelve and was labeled stability of pace. The second factor had high pattern coefficients (.807 to .652) in minute one and two and was labeled initial sprint. Two factors of the proposed structure were isolated and identified from the data. Initial sprint and stability of pace were supported in the performance model. Clearer delineation of the proposed structure may be possible by making available more operational representatives of structure components. This can be achieved by measuring more and shorter distance measures particularly in the first and last minutes of the swim.

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**March 17, 1979**
**5:15 pm**

IEMG AND BALLISTIC MOVEMENT. Jerome V. Danoff, University of Maryland School of Medicine, David L. Kelley, University of Maryland Department of Physical Education.

Ballistic movement is believed to involve high initial acceleration of a limb caused by a sudden activation of agonist muscles. These muscles cease their activity shortly after initiation, and the limb continues to coast until a braking force is applied by antagonist muscles. Consequently, high initial accelerations, approximately constant velocity in mid-range, and closing decelerations are the criteria used to define ballistic movements. In this study Iemg data were collected from the biceps brachii, brachialis, brachioradialis, and triceps brachii of 20 subjects to determine if the Iemg record could be used to confirm a ballistic movement. Subjects performed elbow flexion in a horizontal plane starting from 90° shoulder abduction and continuing towards the chest while seated in a specially constructed dynamameter. Three maximal velocity trials at each of three loads equal to 75, 50, and 25% of maximal isometric strength were used. Maximal isometric Iemg values were also used to normalize the Iemg test data. Angular displacements were taken from a potentiometer coincident with the axis of rotation, and the angular velocity and acceleration were determined by least-squares-fitting the displacement data and numerically differentiating. Although acceleration and velocity curves were found to generally agree with the classical definition of ballistic movement, agonist muscle Iemg activity was found to not drop off as sharply as was previously believed to be true. From 90-100° of movement (total movement = 140°) were completed before Iemg curves of the agonists dropped near values present at 0°. Antagonist activity increased concurrently with the fall in agonist activity. The peaks of the agonists' activity coincided with the start of the mid-range ballistic movement; i.e., the region of approximately constant velocity. Agonist activity past the constant velocity region was believed to be the result of the muscle's continuing to shorten in a relatively unloaded state to keep up with the moving limb. It was concluded that Iemg data may be used to identify ballistic movement, but that both the agonist and the antagonists' activity must be consulted together.

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March 18, 1979
9:00 am

**INTEGRATED MUSCLE ACTION POTENTIALS OF THE ABDOMINAL MUSCULATURE DURING PERFORMANCE OF VARIOUS TYPES OF SITUPS.** Larry Noble, Kansas State University.

The purpose of this study was to compare the integrated muscle action potentials of the abdominal musculature during performance of various types of situps. Eighteen college male volunteers aged 19 to 24 years were used as subjects. The electrical activity of the upper rectus abdominis, lower rectus abdominis, and external oblique muscles was monitored, amplified, and integrated while performing six repetitions of each of the following types of situps:

1. Trunk Curls - a truncated form of a situp where the feet are not anchored, and hip flexion is not involved.
2. AAHPER Situp - the method described in the AAHPER Youth Fitness Test manual (feet are anchored).
3. Conventional Situp - feet are anchored, and the elbow touches the opposite knee on each repetition.
4. Conventional Situp, Feet Not Anchored - identical to method three except the feet are not anchored.
5. AAHPER Situp, Feet Not Anchored - identical to method two except the feet are not anchored.

All situps were performed with the fingers interlocked behind the head and with the knees bent to approximately 90 degrees. Area under the curve summation was accomplished with a general purpose integrator while each subject performed six repetitions of each of the types of situps. A 5x3x18 (treatment by muscle by subject) multivariate analysis of covariance design was used to determine treatment effects. The time required to complete each method was used as the covariate. The Duncan Multiple Range Test was used to find specific between-group differences. Analysis of the data revealed a significant F-ratio for method ($P<.012$) with methods four (conventional situp-feet not anchored) and five (AAHPER situp-feet not anchored) resulting in significantly greater electrical activity than did the other three methods. Also, method three (conventional situp-feet anchored) elicited the least amount of electrical activity. All interactions were insignificant, indicating these effects were consistent for all three muscles and for all subjects. These findings suggest that anchoring the feet and altering the situp to eliminate hip flexion result in diminished electrical activity of the abdominal musculature.

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**March 18, 1979**
**9:15 am**

# MECHANICAL CONSIDERATIONS IN TENNIS RACQUET SELECTION.

James G. Richards, Indiana University; David A. Barlow, University of Delaware; Mohammed A. Quddus, University of Delaware.

This investigation is designed to define and measure some of the more critical mechanical properties of racquets in an effort to determine the advantages and disadvantages of various racquet types. Forty assorted wood, aluminum, and composite racquets of varying quality were weighed and statically balanced to determine the center of mass. The racquets were then placed in a relatively frictionless pendulum system whereby the observed swing periods were recorded with accuracy within five microseconds. The center of percussion for each racquet was then calculated. Next, the racquet grips were mounted in a specially designed vise which held the racquet with equal force (30 kg) from four sides. Two crystal force transducers were located behind the back plate of the vise. These enabled the maintenance of a constant grip force and the subsequent monitoring of forces and vibrations encountered in the grip during impact. A linear displacement transducer was mounted one centimeter away from the racquet bow at the extreme end of the racquet head. This recorded the deflection of the end of the racquet upon impact thereby giving an indication of the relative longitudinal flexibility of the racquet shaft. A Pearson product-moment correlation matrix was derived to find significant relationships between the variables of racquet weight length, center of mass, flexibility, manufacturers' assigned weight, moment of inertia, center of percussion location, and amount of force transmitted into the grip at impact. An analysis of variance was performed to locate significant differences between wood and non-wood racquet groups on the basis of these variables. Significant relationships were found between the variables of manufacturers' assigned weight and gram weight, gram weight and moment of inertia, manufacturers' assigned weight and moment of inertia, racquet length and moment of inertia, moment of inertia and center of percussion, and center of percussion and the amount of force transmitted into the grip at impact. Significant differences were found between wood and non-wood racquet groups for the variables of racquet length, center of percussion location, and racquet shaft flexibility, with the wood racquets being longer, having a center of percussion location closer to the throat, and being about one third less flexible. It can be concluded that there are indeed significant differences between different types and compositions of racquets and that these differences may have a direct effect upon a player's performance.

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March 18, 1979
9:30 am

# THE INFLUENCE OF GRIP FIRMNESS ON TENNIS RACKET-BALL IMPACTS.

Carol A. Putnam and John A. W. Baker, The University of Iowa.

Selected responses of a tennis racket and ball during the impact phase were investigated in an attempt to establish the influence of grip firmness on ball velocity after impact. Two extreme conditions of grip firmness were considered: (a) when the grip of the racket was firmly clamped to a rigid metal support frame and (b) when the racket was allowed to freely stand on its butt with no other means of support. The study consisted of two parts:

(1) Three multiple exposure photographs were taken of ball impacts on a variety of rackets with different constructions, flexibilities, string types and string tensions under the two conditions of grip firmness. Measurements were taken from enlargements of these photographs in order to calculate the horizontal component of post- and pre-impact ball velocity.

(2) A high speed cinematographic analysis was conducted of one racket-ball impact under both conditions of grip firmness.

It was found that the magnitudes of the impulse applied by the racket to the ball remained the same for stationary clamped and free-standing rackets. The cinematographic analysis of one racket showed that the magnitude of transverse deflection of the racket head at the level of impact, was unmodified by the two extreme conditions of grip firmness.

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March 18, 1979
9:45 am

## TIBIAL NERVE CONDUCTION VELOCITIES IN ATHLETIC AND UNTRAINED COLLEGE MALES. David Upton, University of Massachusetts.

Tibial nerve conduction velocity was assessed in six endurance trained, six strength trained, and six untrained college age men. Subjects were tested on two separate days and five trials of nerve conduction velocity were obtained at each session. Percutaneous stimulation of the tibial nerve was performed at the popliteal fossa and the medial malleolus. The resulting muscle action potentials were recorded from the abductor hallucis muscle of the foot. No significant difference was found between day one and day two means and the day-to-day reliability was high ($r = .97$). The mean conduction velocity of the endurance trained group (46.4 meters per second) was not significantly different from the untrained group (49.7 meters per second) nor was the strength trained group (53.7 meters per second) significantly different from the untrained group. However, a highly significant difference was found between the strength and the endurance trained groups ($p < .01$). It should be noted that the tibial nerve conduction velocity of the untrained group is intermediate in speed to the other groups. This finding may reflect a difference in the motor unit recruitment patterns during specific types of athletic training. For example, strength trained athletes rely predominantly on fast twitch motor units which are fast conducting, while endurance trained athletes rely predominantly upon slow twitch motor units which are slow conducting. Nerve conduction velocity may be influenced by specific training regimens as is evidenced by the fast conducting system of weight lifters and the slow conducting system of the endurance athletes. Therefore, one cannot conclude that a slow nerve conduction velocity is always associated with an unhealthy nervous system.

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March 18, 1979
10:00 am

# IMPLEMENTING TITLE IX: CONCERNS OF UNDERGRADUATE PHYSICAL EDUCATION MAJORS.

Linda L. Bain, University of Houston.

Compliance with Title IX of the Education Amendments of 1972 which forbids sex discrimination in educational programs receiving federal financial assistance has required substantial changes in many physical education and athletic programs. Professional preparation institutions must prepare prospective physical educators for the responsibility of implementing Title IX. Information about the concerns of undergraduate majors can be useful in planning appropriate professional preparation experiences. The purpose of this study was to identify the concerns of male and female undergraduate physical education majors regarding implementation of Title IX in physical education and athletics. The instrument used consisted of 37 statements of concern, 17 relating to athletics and 20 relating to physical education. Subjects responded to the statements on a scale ranging from 1 - strongly agree to 5 - strongly disagree. Subjects consisted of 38 females and 37 males enrolled in a secondary school physical education course or in student teaching at the University of Houston during the spring of 1978. The instrument was administered following an informational presentation about Title IX but prior to discussion of concerns about implementation. Male and female subjects were compared on an athletics concern score and on a physical education concern score using a t-test with an alpha of .01. Differences between males and females were significant on both scores with males indicating a higher degree of concern. Males seemed less convinced of the qualifications of women to handle responsibilities in athletic programs and in coeducational classes. Males also anticipated more negative responses of secondary school students to coeducation classes. These results may indicate the need for professional preparation institutions to attempt to alter the male physical educator's perception of the competence of his female counterpart and to provide prospective teachers, especially men, with more exposure to instructional approaches which prepare them to deal with heterogeneity of performance.

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March 18, 1979
2:00 pm

## AN ANALYSIS OF THE EFFORTS AND PROCEDURES OF SELECTED NEW YORK STATE PUBLIC HIGH SCHOOLS TO PROVIDE EQUAL OPPORTUNITY AND COMPLY WITH TITLE IX IN INTERSCHOLASTIC ATHLETICS. Donald F. Staffo, Ohio State Univ. and Liverpool, N.Y. Central Schools.

The purpose of this study was to determine and analyze the various measures that the selected public high schools in New York State have taken in their efforts to provide equal opportunity and comply with Title IX legislation regarding interscholastic athletics. The study is particularly concerned with the kinds of changes, degrees of change, and the reasons for the changes which have occurred since 1975, as well as the effect and impact of Title IX on the interscholastic athletic programs in the selected schools. A questionnaire developed by the researcher was mailed to one hundred sixty-six public high schools in New York State selected from a systematic, proportional, stratified, random sample. The results are based on a sixty-five percent return with responses representing all size classifications of schools and all geographical sections of the state, including New York City. The statistical procedures used to analyze the data included absolute frequencies, adjusted frequencies in the form of percentages, and tests for chi square. The results of this study indicate that more than seventy percent of the responding schools made budget revisions so both sexes would more fairly benefit from the tax dollar, seventy-five percent made program revisions to better provide equal opportunity for boys and girls, forty-four percent made scheduling changes to comply with Title IX stipulations, and the types and levels of activities which were added to the various programs were usually dictated by the interests and needs of the students. Some general conclusions are that a greater percentage of the total athletic budget is now being allocated to the girls' program, there is an increase in female participation in interscholastic athletics, an increase in the number of sport teams and athletic opportunities available to girls, the addition of "mixed" or co-educational teams, girls being allowed to try out for the boys' team in non-contact sports, and equality in a number of athletic support services. Figures were obtained to support these and other findings with recommendations offered to better enable both boys and girls to have the opportunity and encouragement to reach their full potential in interscholastic athletics should they so desire. Gratitude is expressed to the New York State public school administrators who participated in this study and to the jury of authorities who assisted the researcher throughout this study.

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**March 18, 1979**
**2:15 pm**

## COMPETENCIES FOR COACHING FEMALE ATHLETES.

M. Catherine Tamsberg, University of Wisconsin-Madison.

The purpose of this study was to investigate the role of the coach of the female athlete. The specific goals of the investigation were: 1) to identify competencies considered to be important for the coach of the female athlete, and 2) to determine if the real structure of the role of the coach as identified by coaches of female athletes paralleled the hypothesized multidimensional role. The participants were selected from colleges and universities throughout the United States and included five hundred subjects randomly selected from coaches of female athletes at four-year AIAW institutions. Subjects were asked to respond, by mail, to a Coaching Competency Survey which was designed to elicit the degree of importance which they attached to various coaching competencies which the coach of the female athlete might be expected to possess. Responses were received from 349 subjects-a total return of 69.8 percent. Data were analyzed using factor analytic techniques. Two factor models, principal components and alpha factor analysis, were applied to the data. Each of the initial solutions was then subjected to an orthogonal and an oblique rotation procedure. A comparable common factor structure as outlined by Harris and Harris (1971) was extracted from the four derived solutions. This factor structure was then compared with the hypothesized dimensions of the role of the coach of the female athlete. Results indicated that the role of the coach was viewed as being multidimensional. The six primary dimensions which emerged were: scientific applications, medical-legal aspects, administrative aspects, evaluative aspects, individualized training techniques, and value considerations. Three of the seven secondary dimensions were identified as: commitment to development of sport programs, granting of athletic scholarships, and public relations.

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March 18, 1979
2:30 pm

PLAYERS PERCEPTIONS OF LEADERSHIP QUALITIES FOR COACHES. Carolyn Vos Strache, California State University, Northridge, California.

This study was a quasi-experimental investigation of the relationship between perceptions of ideal and actual leader behavior and team performance outcome, skill level, and class level. The hypotheses were based on two leadership theories proposed by House (1973) and Hersey and Blanchard (1972). The path-goal theory proposed that "leaders should increase the number and kinds of rewards available to subordinates. The leader should also clarify realistic expectations and reduce barriers to the accomplishment of valued goals" (House,1973). The life-cycle theory suggested that in order for leader behavior to be effective, the leader's behavior must change as the followers mature. The Leader Behavior Description Questionnaire was used to score twelve subscales of leader behavior: (1)representation, (2)demand reconciliation, (3) tolerance uncertainty, (4)persuasiveness, (5)initiating structure, (6)tolerance freedom, (7)role assumption, (8)consideration, (9) production emphasis, (10)predictive accuracy, (11)integration, and (12)superior orientation. A 2x2 and 2x4 analysis of variance was used to test the hypotheses. It was hypothesized that there would be no significant relationship between the perceived leadership style of the coach and the win-loss record of the coach on women's intercollegiate basketball teams. Results rejected the null hypothesis for the subscales of tolerance uncertainty, persuasiveness, predictive accuracy, and production emphasis. It was hypothesized that there would be no significant difference between perceived ideal and actual leader behavior and class level. Results rejected the null hypothesis for the subscales of persuasiveness, initiating structure, production emphasis, and superior orientation. It was hypothesized that there would be no significant difference between perceived ideal and actual leader behavior and starter/non-starter status. Results rejected the null hypothesis for the subscales of representation and persuasiveness. It was hypothesized that there would be no significant interaction between perceived ideal and actual leader behavior on win-loss record, class level, and starter/non-starter status. Results rejected the null hypothesis for the subscale of persuasiveness. The findings of the investigation supported certain aspects of the path-goal theory. It was concluded that starters perceived their leader to be more persuasive than the non-starters, therefore, assisting the starters in clarifying the direction for effective performance. The findings did not support the life-cycle theory. It was concluded that the range represented by class level may not have been broad enough to allow for a differentiation in maturity.

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**March 18, 1979
2:45 pm**

## THE OBSERVATION AND DESCRIPTION OF THE TEACHING BEHAVIOR OF SELECTED PHYSICAL EDUCATION TEACHERS.

Bennett J. Lombardo, Rhode Island College; John T. F. Cheffers, Boston University.

A persistent criticism of observation research relates to the single visitation technique as opposed to successive,daily, repeated observations extending across curriculum changes. Therefore, the purpose of this study was to observe and describe the teaching behavior and interaction patterns of four elementary physical education teachers longitudinally. Each subject was an experienced and qualified teacher of physical education. A modified case study design was employed. Specifically, each teacher was observed twice a day(AM and PM) for a period of twenty days, resulting in forty observations per subject. The instrument used was The Cheffers Adaptation of Flanders Interaction Analysis System (CAFIAS), which describes the interaction patterns and teaching behavior in the classes. Feedback was provided teachers in the study in the form of post-lesson conferences. Using the program developed at Boston University to facilitate the data analysis and compute the required ratios and interaction matrices,data were presented in three major categories: 1. Use of CAFIAS categories, 2. Thirty-one major CAFIAS parameters, and 3. Patterns of interaction between teacher and students, as well as among students. Findings indicated that: 1) Teaching behavior and interaction patterns remained stable. 2) In this study teaching patterns could be summarized universally as lecture-information giving, teacher direction, and predictable student response. Teacher response to student behaviors in the various forms of feedback was singularly absent. 3) Slight differences were noted across grades K-6, with kindergarten classes being the most unique. 4) Teachers in this study rarely required students to utilize higher levels of cognitive functioning other than to produce robot-like responses. Genuine student interpretation was rarely observed. 5) Nonverbal student initiation was much higher in afternoon classes. 6) Female teachers used more verbal praise, encouraged student nonverbal interpretive responses, allowed much more pupil initiation, and utilized students as teachers much more than their male counterparts. However, in 27 of the 31 parameters measured there was no difference between male and female teachers. 7) As observed in this study, teaching behavior and interaction patterns remained constant across the days of the week, with minor differences noted on Mondays and Fridays.

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March 18, 1979
3:00 pm

THE DIMENSIONALITY OF THE SPEED OF BODY MOVEMENT DOMAIN. James G. Disch, Rice University.

The purpose of this study was to examine the theoretical dimensions of speed of body movement. Six dimensions were hypothesized for this domain of human motor performance: 1) linear sprinting speed, 2) curvilinear sprinting speed, 3) controlled sprinting speed, 4) total body speed, 5) arm speed and 6) leg speed. Eighteen tests were selected to equally represent each hypothesized dimension. The tests were administered dimension. The tests were administered to a sample of 73 college men. Multiple trials of the tests were given and the intraclass reliabilities were estimated to exceed .950 in every case. Trend free trials were then averaged to establish criterion scores. These criterion scores were analyzed using two factor analytic models and two rotations. Analysis of the results indicated that four robust factors were present. The hypothesized dimensions of linear and curvilinear sprinting speed were consolidated into a general SPRINTING SPEED factor. This factor was represented by interval runs of a 40 yard sprint, both on the straightway and on the curve. The CONTROLLED SPEED factor (agility) was confirmed and measured by the dodge run and boomerang tests. The factors of ARM SPEED and LEG SPEED were also confirmed. These factors were measured by tests modified from Fleishman's work. The hypothesized dimension of total body speed was found to be test specific. The four robust factors accounted for up to 74% of the variance of the 18 variables. A hierarchical factor analysis was performed on the four robust factors and the results indicated that one general speed factor was present. However, it accounted for only 33% of the variance of the four robust factors. The conclusions were that four factors represented the dimensions of the speed of body movement domain: 1) sprinting speed, 2) controlled speed, 3) arm speed, and 4) leg speed. There was some generality to this domain, but a large portion of the test variability was test specific.

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March 17, 1979
3:30 pm

## THE RELATIONSHIP BETWEEN LEG STRENGTH AND MOVEMENT TIME FOR WOMEN WITH BODY COMPOSITION FACTORS HELD CONSTANT.

Cathryn F. Disch, St. John's School and Andrew S. Jackson, University of Houston.

The purpose of this study was to examine the relationship between movement time and leg strength for women with body composition factors held constant. The following research hypotheses were tested with body composition factors held constant, force will be related to acceleration and with body composition factors held constant, force and velocity will be independent. The subjects were 36 adult females. The dependent variables were three measures of movement time at 0 to 20 feet, 20 to 40 feet and 40 to 60 feet. There were five independent variables. One independent variable was leg strength measured by the leg press on the Cybex at a speed of 20° per second. The other independent variables were four body composition factors. These were subcutaneous body fat, lean body weight measuring muscle mass and bone structure, lean body weight measuring bone diameters, and fat specific to the pelvic girdle. A theoretical model was developed to test the research hypotheses. The data were analyzed using multiple regression and the full model consisting of all the independent variables was significant and accounted for 47.4% of the 0 to 20 feet movement time variance. Using step down procedures leg strength was found to account for a significant proportion of 0 to 20 feet movement time. The first research hypothesis was accepted and it was concluded that leg strength was related to movement time with body composition factors held constant. Further analyses indicated that leg strength and speed were not related at later stages of the sprint when the initial stage was statistically controlled. This showed that leg strength was related to the common variance of a sprint, but not the unique components of each stage of the sprint.

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March 18, 1979
3:45 pm

# PERSON CLUSTERS ON SELECTED MOTOR PERFORMANCE VARIABLES OF FOUR AND FIVE YEARS OLD PRESCHOOL CHILDREN.

Reinhard R. Bergel, University of California, Berkeley.

A motor performance typology of one hundred four years and one hundred five years old preschool children was developed based on four factors extracted by factor analysis from data of 35 motor performance variables. The factor analysis identified the variables, the major components of the motor domain of both groups of subjects. These components, those that accounted for the major proportion of the variance, were identified as Power and Gross Motor Coordination, Upper Body Strength, Fine Motor Coordination, and Balance and Coordination. Factor structure similarities of the motor abilities of the two participant groups were assessed according to the method developed by Kaiser, Hunka, and Bianchini (1971). The procedure that was followed in developing the PERSON CLUSTERS was the methodology developed by Tryon (1967). This procedure called the Condensation Method, is designed objectively to form object-clusters (O-analysis). The results of this analysis is to place within each cluster individuals with similar performance profiles. Each cluster consists of individuals with the same profiles across the selected set of composite scores. Sixteen variables which best described the four factor defined components were used in formulating the person clusters following Tryon's condensation method. Ten forms of person clusters appeared, which included 98% of the groups. The four person clusters that accounted for the four years old (68%) accounted for only 12% of the five years old. The six person clusters that accounted for the majority of 5 years old (88%) accounted for only 32% of the four years old. It became evident from the person clusters that not many children were good in all of the components that were assessed and similarly not many were poor in all of the components. It also became evident from the distribution of numbers of children by age within the several types that there was a substantial difference in the motor performance typology of four and five years old preschool children.

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March 18, 1979
4:00 pm

THE FACILITATION OF FUNDAMENTAL MOTOR SKILL LEARNING IN YOUNG CHILDREN. Susan E. Miller, Kansas State University; John Haubenstricker and Vern Seefeldt, Michigan State University.

The purpose of this investigation was to determine the effectiveness of various programs of motor skill instruction for three and four year-old children. Seventy-nine subjects were assigned to one of three treatment groups. Two groups received identical programs of instruction; one being taught in a conventional manner (Traditional) and the other involving parents as co-teachers (Parent). A third group (Free Play) was permitted to use all the available equipment for self-initiated activities, but was not provided with a specific instructional program. Each group met at the same campus facility for one-hour activity periods twice each week, for a total of twenty-seven weeks. Although the curriculum emphasized direct instruction in fundamental motor skills, body management, rhythmic and creative movement activities were included. The developmental levels of ten fundamental motor skills were assessed at the beginning and conclusion of the program. The data were subjected to a multivariate analysis of covariance procedure using age and pretest scores as covariates. Tests of significance were performed for three ordered contrasts. The results showed no significant differences between the Free Play Group and a control group which was included to test for the effects of maturation. The Traditional and Parent Groups, however, performed significantly better than the Free Play Group, indicating that programs of instruction and directed practice are more effective than programs of Free Play in increasing the fundamental skill level of young children. The third contrast failed to show a difference between the Traditional and Parent Groups. These results suggested that the two methods of instruction are equally effective in promoting the development of fundamental motor skills.

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March 18, 1979
4:15 pm

**ANTHROPOMETRIC MEASUREMENTS, AND ARM AND LEG SPEED PERFORMANCE OF MALES AND FEMALES AS PREDICTORS OF SWIM SPEED.** Leon E. Smith, Florida Atlantic University.

Forty college males and females with average ages of 21 and 19 years respectively, completed the following speed tests in a 25-yard pool: arms alone, legs alone and crawl swim. In addition the subject's body weight, height, arm and leg length were measured. A review of the literature revealed conflicting results concerning the relationship and significance of arm and leg speed in reference to swim speed. Results showed that leg speed was the only variable that the males were not superior to the females. A comparison of the arm, leg, and swim speed of the male and female group, in addition to the fastest swimmers in these groups, revealed that the principal factor related to the males being faster swimmers than the females was attributable to their greater arm speed. In general, the magnitude of the inter-correlations were low and individual differences in anthropometrical measurements had little positive association with swim speed. Multi correlations were reported and the derived regression formulas provided a close fit relative to the prediction of the dependent variable, swim speed. Arm speed had a higher predictive relationship to swim speed than did leg speed. The results of the study indicated that for males and especially female swimmers, in order to improve swimming speed more emphasis should be directed toward increasing the effective speed of the arm stroke and less effort should be expended upon kicking. It appears that there is an optimum ceiling level of kicking speed for each individual after which a decrease or increase in kicking action has no effect and/or negative influence upon crawl swimming speed.

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March 18, 1979
4:30 pm

**A STEPWISE DISCRIMINANT ANALYSIS OF EIGHT SELECTED BASKETBALL SKILL TESTS.** David R. Hopkins, University of Texas of the Permian Basin.

The purpose of this study was to investigate the ability of eight selected basketball skill tests to discriminate between all-star and non all-star performers at the 1978 University of Minnesota, Duluth Basketball Camp for boys. The eight variables were selected on the basis of previous skill testing and factor analytic studies. The eight skill test items were: 1. front shot, 2. foul shot, 3. free jump, 4. jump and reach, 5. push pass, 6. speed pass, 7. zig-zag dribble and 8. dribble. Items 1, 2, 4, 5, 6, 8 were selected from the AAHPER Basketball skill test for boys. The tests were administered to all-star (N=55) and non all-star (N=38) performers at the UMD basketball camp. Performance categories of all-star and non all-star were established by previous ratings of three high school and three college basketball coaches. A stepwise discriminant analysis was used. The statistical procedures revealed six variables that significantly contributed to the discriminant function. The leading predictor of group membership was the speed pass. The remaining significant variables according to the magnitude of their discriminant function coefficients were the push pass, dribble, front shot, jump and reach and the zig-zag dribble. The stepwise discriminant regression equation comprised of the six variables reclassified 42 of the 55 all-star selections and 29 of the 38 non all-star selections. The regression equation properly reclassified 76% of the UMD basketball camp participants. It was concluded that a basketball skill test battery comprised of the six test items (push pass, front shot, speed pass, jump and reach, dribble, and the zig-zag dribble) would measure basketball playing ability and distinguish between all-star and non all-star performers at the UMD basketball camp.

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March 18, 1979
4:45 pm

## THE EFFECTS OF TWO TRAINING TECHNIQUES ON THE VELOCITY OF A KARATE STRIKE.

Mark D. Grabiner, Southern Illinois University at Carbondale.

The purpose of this study was to determine if, as a result of participating in a five-week training program, there were differences in the striking velocities of a karate strike between two experimental groups and a control group. The training techniques were of a progressive pacing nature. One experimental group used one-pound hand-held weights as resistance to movement. The second group had no additional resistance to movement. Striking velocities were measured with a DEKAN AUTOMATIC PERFORMANCE ANALYZER. Statistical analysis by a 3X2 ANOVA indicated no significant difference ($p > .05$) in striking velocities as a result of either training technique. Based upon the findings of this study it was concluded that a five-week program of progressive pacing, either with or without the resistance offered by one-pound hand-held weights, did not affect the striking velocity of seiken chudan-tsuki.

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March 18, 1979
5:00 pm

AN ANALYSIS OF ELITE DECATHLON PERFORMANCES. William H. Freeman, State University of New York, Brockport.

This analysis involved the ten events of the men's decathlon in all performances which scored 8,000 points or higher, based on the 1962 IAAF Scoring Tables, attempting to (1) determine the interrelationships among the events and the final scores, (2) look for areas of difference compared to sub-8,000 point performers, and (3) decide whether the performance levels can be predicted on the basis of significantly fewer events. The performance marks for all decathlons scoring 8,000 points or higher through 1977 were collected. Times which were not based on fully automatic timing devices were corrected using the IAAF standards of correction. Means and standard deviations were computed, and Pearson correlations between all pairs of the events and the events and the final scores were computed. The resulting summative data and correlations were studied and compared to the results of earlier studies of decathlon performances. The performances in each event were more balanced in relation to the scoring tables than in earlier studies. The correlations among the events and between each event and the final score were generally lower than in previous studies. Based on 104 decathlons which scored 8,000 points or better on electronic timing and the 188 decathlons which achieved the same score with manual timing, five conclusions were reached: (1) elite-level decathletes show less variability in the scoring levels of performance from one event to the next than do lower-level performers; (2) these more balanced performances yield lower correlations between events and between events and the final score; (3) the use of predictive formulae are of little value in elite-level decathlons; (4) elite-level total scores appear to be more a factor of balanced performance at a high level than of exceptional performance in a few specialty events; and (5) in developing the elite-level decathlete, early attention should be toward developing all ten events equally toward an optimal level, before concentrating on a few specialty events. Dr. Barry Shultz provided assistance in programming and consultation in statistical discussions.

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**March 18, 1979**
**5:15 pm**

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THE EFFECT OF EXERCISE AND DIET MODIFICATION ON BLOOD LIPIDS IN MIDDLE-AGED MEN. William G. Squires, G. Harley Hartung, Jackie Young, Stephen Zinkgraf and George Jessup, Texas A & M University and Baylor College of Medicine.

The purpose of this study was to explore the effects of six weeks of endurance exercise and diet modification on the levels of high density lipoprotein (HDL), total cholestrol (TCHL) and triglyceride (TRIG) in the plasma of 60 sedentary males between the ages of 35-65 years. All subjects were volunteers and were randomly divided into one of four groups (N=15), control, diet only, exercise only and exercise with diet. The diet groups were instructed in and asked to maintain a low saturated fat, low cholestrol diet high in complex carbohydrates. The exercise groups participated in a controlled, progressive jogging program; they were taught how to jog and exercised one time per week under supervision and two times per week on their own with intensity and duration increased progressively. Subjects in the control group were asked not to change their exercise or dietary habits. The pre-treatment variables of HDL, TCHL, TRIG, and TCHL/HDL ratio were obtained and analyzed according to standard procedures of the Lipid Research Centers. An analysis of variance was calculated on all pre-treatment variables across all groups and yielded non-significant F ratios for all variables indicating that the groups were essentially equal. Repeated measurements were made at the end of the six week treatment period on all variables with respect to groups over time. The analysis yielded non-significant F ratios for HDL and TCHL/HDL ratio ($P = > .05$). Significant decreases in TCHL (202.5 mg % to 191.95 mg %) and TRIG (143 mg % to 123 mg %) were found over time irrespective of groups. No differences were found between groups. These data suggest that six weeks is not enough time for the treatment modalities used to significantly alter blood lipids in middle aged males.

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March 19 , 1979
9:00 am

NOMOGRAM FOR DETERMINING AEROBIC POINTS REQUIRED TO IMPROVE CARDIOVASCULAR FITNESS. James W. Terry, Missouri Western State College; Dewayne J. Johnson, The Florida State University; Charles R. Erickson, Missouri Western State College

The purpose of this study was to develop a nomogram that would be useful in an adult fitness program for predicting the number of aerobic points required to improve cardiovascular fitness. The two independent factors used in the nomogram were the performance scores on the PWC-170 and a modified Astrand-Rhyming test. Subjects for this investigation were fifty young male adults who were participating in an adult fitness program and showed improvement in the level of cardiovascular fitness. Each subject carefully recorded the amount and type of exercise that they did each week. Aerobic points were assigned to this exercise using guidelines provided by Cooper. Each subject was given a PWC-170 and a modified Astrand-Rhyming test. The score for the modified Astrand-Rhyming test was determined from the heart rate at the end of the first six minutes of the PWC-170 test. Group means for the variables were: PWC-170 = 988.84 (S. D. = 215.4); Modified Astrand-Rhyming test = 46.19 ml/kg/min (S. D. = 15.96); and total weekly aerobic points = 39.18 (S. D. = 9.14). Based on this data, a regression equation for prediction of aerobic points based on current levels of fitness was calculated. The equation ($Y = a + b_1X_1 + b_2X_2$) ($Y$ = aerobic points; $X_1$ = PWC-170; $X_2$ = ml/kg/min.) was the basis for the formulation of the nomogram. The nomogram will provide adult exercisers an easy method of determining the number of aerobic points that are required for a person with their level of fitness to improve that level of fitness.

James W. Terry
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March 19, 1979
9:15 am

# A COMPARISON OF NUTRITIONAL KNOWLEDGE AND ATTITUDES TOWARD PURPORTED MISCONCEPTIONS OF ATHLETES AND NONATHLETES.

Donna E. Diefenbach and Thomas R. Whiddon, University of Montana.

It was the purpose of this study to determine the nutritional knowledge and attitudes toward misconceptions of athletes and nonathletes. Specifically, the study investigated whether the purported misconceptions of athletes in Nutrition for Athletes: Handbook for Coaches and Food for Fitness were supported by athletes and whether differences existed between athletes and nonathletes toward these misconceptions. A nutrition questionnaire was developed and administered to 95 males and females, 49 athletes and 46 non-athletes. The questionnaire consisted of three parts: a personal inventory for biographical data, a likert scale to assess attitudes toward nutritional statements, and a nutrition knowledge test developed by Prefontaine at the Universite di Montreal. The following conclusions were supported by the research: (1) substantial percentages of the athletes and nonathletes supported the purported misconceptions: (2) a majority of the athletes and nonathletes did not support the five nutritional facts which were inserted among the misconceptions; (3) differences existed between athletes' and nonthletes' attitudes toward misconceptions: and (4) no significant differences in nutrition knowledge were found as measured by the nutrition knowledge test.

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March 19, 1979
9:30 am

## EFFECT OF REGULAR EXERCISE ON THE COGNITIVE CAPABILITIES AND MENTAL HEALTH OF YOUNG AND MIDDLE-AGED MEN AND WOMEN.

R. John Young, Edward J. Funk & Sons, Inc.,R.L. Rosenthal, Washington U.

This study evaluated the effect of a three month program of regular exercise on the cognitive capabilities and mental health of 160 subjects representing four discrete groups based on age and sex. The groups (and mean age) were: young male (20.26); young female (19.83); middle-aged male (40.66); and middle-aged female (38.72). The exercise program was designed to improve flexibility, muscular strength and endurance and cardiovascular efficiency. Before and after the exercise program a test battery was administered to assess functioning in a number of domains: intelligence (WAIS Digit Symbol and Block Design); brain function (Trail-Making); speed of performance (Crossing-Off); memory (WMS Visual Reproduction); morale and life satisfaction (Life Satisfaction and Control Ratings); depression (Zung Repression Scale and MAACL); anxiety (MAACL); hostility (MAACL); and perception of one's own health status (Health Rating Scale). Improvement was observed on several physiological parameters, both at rest and during exercise, indicating more efficient cardiovascular functioning at the post-test. ANOVA revealed significant age differences on Digit Symbol ($p < .05$) and Visual Reproduction ($p < .01$) indicating that middle-aged subjects performed less well on these tests. Females scored significantly ($p < .001$) higher on Digit Symbol but significantly ($p < .05$) lower on the Trail-Making test. Regardless of sex and age, significant ($p < .001$) improvement in performance was observed from pre to post-test on Digit Symbol, Block Design and Trail-Making. In addition, significant ($p < .001$) decreases in anxiety, depression and hostility level were observed from pre to post-test. These data confirm age decrements in perceptual-psychomotor intelligence and non-verbal memory. In addition, cognitive capabilities and mental health appear to be influenced in a positive manner by participation in a regular and balanced exercise program.

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**March 19 , 1979**
**9:45 am**

THE EFFECTS OF A SEASON OF COMPETITIVE ROAD-RACING ON THE BODY COMPOSITION, PULMONARY FUNCTION, AND CARDIOVASCULAR SYSTEM OF MALE SPORT CYCLISTS. H. Robert Perez, The Florida State University.

Thirteen competitive cyclists (Class I, II, and III) were tested for cardiovascular, pulmonary, and body composition adaptations during the course of a five-month competitive season. Oxygen consumption was measured by open circuit spirometry; forced vital capacity, forced expiratory volume, and maximal voluntary ventilation by standard spirometric techniques; and body density by hydrostatic weighing. Specifically, pre (T1), mid (T2), and postseason (T3) values for VO2 max, max VO2 debt, forced vital capacity, forced expiratory volume, maximum voluntary ventilation, percent body fat, lean body weight, and anaerobic power were studied. ANOVA revealed a significant increase in VO2 max (liters/min and ml/kg/min), and a significant decrease in resting heart rate ($p < .05$) during the first eleven weeks of the season. These changes were followed by a significant increase ($p < .05$) in anaerobic power and total oxygen debt during the next 12 weeks of the season with no additional increment in VO2 max or resting heart rate. After 23 weeks of training and competition, the cyclists demonstrated no significant change in body composition or pulmonary function measures. This study suggests that due to the nature of their training program, cyclists unlike other athletes, are able to maintain, and in some cases, improve their physiological readiness to perform throughout a season of competition.

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March 19, 1979
10:00 am

SELECTED ASPECTS OF PULMONARY FUNCTION AND MAXIMAL OXYGEN UPTAKE OF ELITE COLLEGE BASKETBALL PLAYERS. Paul Vaccaro, University of Maryland; Jerry P. Wrenn, University of Maryland; and David H. Clarke, University of Maryland.

Thirteen members of the University of Maryland basketball team were assessed for pulmonary function and maximal oxygen uptake at the peak of the 1977 competitive season. All measurements were made on two separate days. On day one, the subjects were measured for FVC, $FEV_{1.0}$, and MVV. On day two, $\dot{V}E$ max, $\dot{V}_{O2}$ max and heart rate max were determined. Results of the analyses indicated that: (1) FVC ranged between 5.78 and 6.88L, $FEV_{1.0}$ between 4.82 and 5.86L, and MVV between 175.80 and 221.63 L/min; (2) $\dot{V}E$ max ranged between 139.00 and 198.50 L/min, $\dot{V}_{O2}$ max between 48.40 and 67.79 ml/kg·min, and heart rate max between 173.00 and 195.00 beats per minute. On the basis of comparison with normative data it was concluded that participation in basketball provided little advantage in pulmonary function and that these athletes, as a group, could not be characterized as having superior aerobic power.

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March 19, 1979
10:15 am

# FITNESS LEVELS OF UNIVERSITY CROSS-COUNTRY SKIERS

Robert O. Ruhling and Thomas W. Storer, U of Utah

In an attempt to contrast fitness indices of U.S. Nordic skiers (Hanson,J APPL PHYSIOL,1973)to university skiers, physiological responses of the Men's University of Utah Cross-Country Ski Team(N=3)were assessed at the end of dry-land training. Ss reported to the lab postprandial wearing shorts & shoes. Body fat % was assessed by the method of Zuti & Golding. Lung volumes and capacities were determined using a respirometer.Following a 5 minute sitting rest period, Ss walked on a motor-driven treadmill at 100 m $\cdot$ $min^{-1}$ (3.7 mph) with a 1% increase in slope each minute until volitional exhaustion, achieving VO2 max. Minute-by-minute measures for VO2 were made using standard open-circuit, indirect calorimetry techniques. Oxygen debt was determined from values obtained during a 15 minute sitting recovery. Comparative results(max values,where apt)are presented:

| | Age (yr) | Ht (cm) | Wt (kg) | BSA ($m^2$) | Fat (%) | LBW (kg) |
|---|---|---|---|---|---|---|
| Hanson, 1973 | 26.3 | 181.2 | 73.1 | 1.93 | 8.9 | 66.6 |
| This study | 20.3 | 181.7 | 73.0 | 1.93 | 11.6 | 64.5 |
| p | >.05 | >.05 | >.05 | >.05 | <.05 | >.05 |

| | TLC (L) | VC (L) | FRC (L) | RV (L) | FEV.5 ( % ) | FEV 1 ( % ) |
|---|---|---|---|---|---|---|
| Hanson, 1973 | 8.2 | 6.1 | 4.4 | 2.2 | 50.7 | 76.1 |
| This study | 7.2 | 5.8 | 3.8 | 1.4 | 61.0 | 86.3 |
| p | >.05 | >.05 | >.05 | <.05 | >.05 | >.05 |

| | VEBTPS | VO2 | VCO2 | O2 Pulse | HR |
|---|---|---|---|---|---|
| | ( L $\cdot$ $min^{-1}$ ) | | | ($ml \cdot b^{-1}$) | ($b \cdot min^{-1}$) |
| Hanson, 1973 | 155.9 | 5.48 | 5.37 | 29.9 | 182.6 |
| This study | 136.2 | 4.90 | 3.84 | 27.3 | 183.7 |
| p | >.05 | >.05 | <.05 | >.05 | >.05 |

Along with an O2 debt of 5.3 L, the data indicate that our Ss compare favorably with the U.S. team. In addition,these results are serving as baseline indices for modifications of the on-snow training programs in an attempt to enhance aerobic power.

Supported in part by PHS Grant No. RR07092

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March 19, 1979
10:30 am

## MENSTRUAL IRREGULARITIES INCREASE IN ENDURANCE TRAINED ATHLETES.

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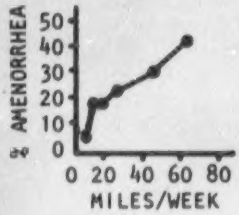
Many track coaches have noticed menstrual irregularities in female distance runners. This observation suggests that endurance training may disrupt the menstrual cycle or even lead to its cessation (secondary amenorrhea). To see if the incidence of amenorrhea correlates with the intensity of endurance training, we sent questionnaires to 400 women on 15 leading collegiate track and field and cross-country teams. Each athlete's event, best performance, height, weight, training program, and menstrual history were obtained. Our final sample consisted of 128 post-menarcheal women who had not taken birth control pills within six months of the survey. Women who had experienced three or less periods in one year were classified as having secondary amenorrhea and all others were classified as "regular." A significant positive correlation was found between the incidence of amenorrhea and the number of miles run per week (see Fig.). It is not clear why the incidence of amenorrhea increases in women running high mileage per week. Amenorrhea may result from low body weight. To study this possibility, a group undergoing similar training stress (middle-distance runners) was obtained. The amenorrheic and regular middle distance runners were of equal height and weight indicating that other factors beside body weight may be involved. A second possible cause of amenorrhea could be the emotional stress of high mileage training and the attendant competition. Our finding that amenorrheic middle-distance runners train intensely an average of one month more each year than their regularly menstruating counterparts provides some support for this possibility. This result may also explain why amenorrheic middle-distance runners had faster performances than those with regular periods ($P < 0.05$), despite equal weekly training mileage in the two groups. However, further studies are needed to fully describe the link between amenorrhea and endurance performance, along with the link between running mileage and amenorrhea.



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March 19, 1979
11:00 am

**NEGATIVE PHYSIOLOGICAL EFFECTS OF PHYSICAL ACTIVITY.** George J. Holland, George Q. Rich III, California State University, Northridge.

This study summarized the possible negative physiological consequences of muscular activity. Only recently has there been recognition of the possibility that man, as a highly individualistic organism, may respond differentially to the stress of exercise, and under certain circumstances respond in a negative physiological fashion. The method of research involved a systematic review of the literature to ascertain the correlation between acute and long term pursuit of exercise and related correlations with morbidity and mortality factors. Documentation is provided for the systemic after effects of "overexertion" or "athletes sickness" which is customarily associated with circulatory vasomotor collapse. The extreme of this physiological syndrome is death, usually occurring after the cessation of work effort. There are other studies which correlate physical activity with physiological trauma. The wealth of research on this topic is so extensive that only a grouping of sports technopathy can be suggested. The relationship between chronic-communicable disease entities and activity habits are discussed. It was concluded that new ideas and research assumptions are required for the study of the phenomenon known as hyperkinesis.

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March 19, 1979
11:15 am

## OXIDANT AIR POLLUTION AND ATHLETIC TRAINING

William B. McCafferty, Cynthia D. Clamp, Jonathon S. Straker and Robert F. Fee. The Sports Medicine Institute, Department of Physical Education, University of Redlands, Redlands, CA.

Measurement of selected pulmonary function tests were performed on six male college football players prior to and following a two-hour practice in the late afternoon for three weeks. Air pollution data was obtained for the days monitored from the South Coast Air Quality Management District monitoring station less than one mile away. Measurement of forced vital capacity (FVC), inspiratory capacity (IC), expiratory reserve volume (ERV), and resting tidal volume (TV) were measured on a Collins 9-Liter spirometer. Exceptionally clear days early in the testing period showed no change in pulmonary function measures. Later days of high oxidant air pollution (Stage I alert) showed decreases in FVC, ERV, IC and TV following the two hour practice. Subjects additionally complained of an inability to take a deep breath, and often could not perform a maximal expiration without a cough. Eye and throat irritation was present in some subjects on high ambient air pollution days. The high levels of ozone during the stage I alert episodes likely account for the observed decrement in pulmonary function. Previous laboratory studies have shown reductions in similar pulmonary function tests at ozone levels similar to those encountered in this field study. It has been suggested that the decrement is the result of a bronchoconstriction caused by pollutant irritation to the airways.

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March 19, 1979
11:30 am

**THE RELATIONSHIP OF INITIAL LEVEL AND TRAINING VARIABLES OF FREQUENCY, DURATION, INTENSITY AND WEEKS OF TRAINING TO POST-TRAINING $VO_2$ MAX.** Mitchell Karpman, University of Maryland; Charles O. Dotson, University of Maryland.

The purpose of this study was to determine a functional equation useful for predicting post-training $VO_2$ max (ml/kg/min) based on subject's initial level and training factors of frequency, duration, intensity and weeks of training. Data recovered from 20 studies (N=441 males) was submitted to a multiple regression procedure. Weighted least squares analysis on 58 data points with initial level, number of weeks, frequency, duration and intensity set as the order of entry into the equation was considered. The multiple regression analysis ($R^2$=.81, standard error of estimate=2.29 ml/kg/min) yielded the following equation: POST = .8361PRE + .1120WEEKS + .8709FREQ + .0227DUR + .1330INT - 4.1481. Regardless of training protocol, initial $VO_2$ max best explained subject's post $VO_2$ max ($r^2$=.70). Intensity was found to be the most important training factor explaining subject's post $VO_2$ max and although added last to the equation, still yielded a significant regression coefficient for predicting post $VO_2$ max. It was concluded that the regression equation generated is useful in predicting post $VO_2$ max by varying training protocols.

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**March 19, 1979**
**11:45 am**

**RELATIONSHIP OF ANTHROPOMETRIC DIMENSIONS TO PHYSICAL PERFORMANCE IN CHILDREN.** M.H. Slaughter and T.G. Lohman, Physical Fitness Research Laboratory, University of Illinois, Urbana-Champaign.

This study is designed to study the influence of selected skinfolds, circumferences, and skeletal widths on physical performance in boys 7 to 12 years of age. The subjects were 159 boys who were participants in the University of Illinois Sports-Fitness Program during summers of 1972-1976. It was hypothesized that physical performance measures are related to physique and that selected anthropometric dimensions of the body can be useful in predicting physical performance of children. The physical performance measures consisted of three tests of running (mile run, 600-yard run and 50-yard dash) and two tests of jumping (standing broad jump and vertical jump). The specific skinfold sites were back, upper arm, side, waist, abdomen, and calf; the circumference sites were upper arm (flexed), forearm, waist, thigh, calf, chest (deflated), waist; skeletal widths included wrist, knee, ankle, elbow, shoulder and hip. Height and weight and one skinfold account for between 25 and 45% of the variance in the five physical performance events; two circumferences, height and weight account for 25 to 36% of the variation in the five physical performance events, and two skeletal widths and height and weight accounted for between 13 and 36% of the variation in the five physical performance events. Combining all significant measurement variables into one analysis resulted in the selection of 5 variables: age, height, abdomen and calf skinfolds and upper arm circumference as the best predictors of physical performance over the five events. The coefficients of determination for these five variables ranged between 36 and 49%. Age alone accounted for between 17 and 29% of the variance in physical performance. The variables selected from the combined analysis were then used to predict performance in five separate age groups of boys. In general age, height and upper arm circumference contribute positively to performance and calf and abdomen skinfolds contribute negatively with regression coefficients not significantly different among age groups. Thus, it was found that physical performance in children aged 7 to 12 years can be estimated from combination of skinfolds and circumferences but with only moderate success accounting for less than 50% of the variance.

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March 19, 1979
12:00

## ANAEROBIC POWER, ANDROGYNY, SOMATOTYPE, ANTHROPOMETRIC, AND BODY COMPOSITION CHARACTERISTICS OF FEMALE ATHLETES.

**L. Dennis Humphrey and Harold B. Falls, Southwest Missouri State University, Springfield, Missouri.**

Anaerobic power (horse power, vertical velocity feet/sec., and power in ft. lbs.), androgyny index, somatotype, anthropometric, and body composition characteristics were determined for varsity female athletes participating for Southwest Missouri State University in AIAW competition. The teams, number of athletes, mean age, mean height, mean weight, mean percent body fat, and mean androgyny index were: Volleyball, 6, 20.6 yrs., 66.9 in., 132.2 lbs., 16.8%, and 85.5; basketball, 11, 20 yrs., 67.4 in., 140.6 lbs., 18.3%, and 83.8; softball, 15, 20.5 yrs., 65.1 in., 136.7 lbs., 19.1%, and 80.8; gymnastics, 7, 20.5 yrs., 62.8 in., 117 lbs., 15.7%, and 82.7; golf, 7, 23 yrs., 65.8 in., 135.4 lbs., 19.6%, and 80.8; field hockey, 13, 20.5 yrs., 64.9 in., 131.5 lbs., 19.1%, and 80.7; and track and field, 20, 20.3 yrs., 65.7 in., 129 lbs., 17.6%, and 80.8. Percent body fat was determined from a series of skin fold measures. The androgyny was calculated by the method of Malina and Zavaleta. Horse power, maximum vertical velocity, and maximum power were determined by the method of Margaria. Somatotype was calculated by the method of Heath-Carter. Mean values were:

| Team | Horse Power | Vertical Velocity Feet/Sec | Power Foot lbs | Somatotype Endo | Somatotype Meso | Somatotype Ecto |
|---|---|---|---|---|---|---|
| Volleyball | 1.17 | 4.75 | 642.1 | 2.6 | 4 | 3.3 |
| Basketball | 1.23 | 4.71 | 677.8 | 3.1 | 3.7 | 2.9 |
| Softball | 1.15 | 4.49 | 631.7 | 3.5 | 4.5 | 2.2 |
| Gymnastics | .97 | 4.39 | 532.5 | 2.2 | 3.7 | 2.4 |
| Golf | .99 | 3.94 | 547.3 | 3.6 | 4.3 | 2.6 |
| Field Hockey | 1.16 | 4.80 | 637.7 | 3.5 | 4 | 2.6 |
| Track & Field | 1.10 | 4.64 | 606.4 | 2.7 | 3.8 | 2.9 |

All data were collected at the conclusion of the competitive season, required a minimum amount of special equipment, and provide AIAW and high school coaches with comparative data. The gymnastics, volleyball, and softball teams won regional championships and finished in the top ten in National competition.

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March 19, 1979
12:15 pm

# AUGMENTER-REDUCER TENDENCIES AND COMPETITIVE TRAIT ANXIETY LEVELS AMONG COLLEGIATE WOMEN ATHLETES.

Joan A. Finn, Southern Connecticut State College

The purpose of this study was to determine if augmenter reducer tendencies of women athletes were related to their competitive trait anxiety levels, and if semi-contact and non-contact athletes differed in their perceptual styles. The subjects of this study were 45 collegiate athletes. Field hockey players were categorized as semi-contact competitors. The non-contact group was composed of tennis and volleyball players. Competitive trait anxiety was assessed with the Sport Competitive Anxiety Test (SCAT). Each subject's perceptual style was measured with the Kinesthetic After-Effects (KAE) test designed by Petrie. Athletes were classified as augmenters, reducers or moderates and as high, middle or low anxious subjects according to their KAE and SCAT scores, respectively. The results showed (1) No significant mean differences (.05 level) between the KAE scores and SCAT scores of the semi-contact and non-contact athletes, (2) No significant differences among the KAE scores of the high, middle and low anxious subjects and (3) A low, but significant correlation between KAE and SCAT scores. The conclusions drawn from the results of this study were as follows: (1) Semi-contact and non-contact women athletes are similar in their perceptual style, regardless of their competitive trait anxiety levels, and (2) Collegiate women athletes tend to manifest greater augmenter perceptual tendencies with higher levels of competitive trait anxiety.

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March 19, 1979
1:00 pm

**THE INFLUENCE OF FITNESS AND SELECTED PSYCHOLOGICAL VARIABLES ON PERCEIVED EXERTION.** Patricia M. Mihevic, University of Wisconsin.

The primary purpose of this study was to examine the influence of fitness on perception of effort assessed with Borg's category rating scale and a magnitude estimation procedure. A secondary purpose was to evaluate the relationship of selected psychological states and traits with perceived exertion assessed by both methods. The Astrand-Ryhming bicycle test for prediction of maximal oxygen uptake was employed to establish a group of high fit (55.81 ± 6.93 ml/kg; N=19) and a group of low fit (35.29 ± 13.6 ml/kg; N=17) women. For the magnitude estimation task, Ss cycled at 600 kpm for 2 minutes followed by 1 minute at 200, 400, 800 and 1000 kpm presented in random order and rated perception of effort at each workload using 600 kpm as the standard. The workload order was identical for both the magnitude estimation task and the category ratings of perceived exertion (RPE). Ss performed both rating tasks on the same day with task order counterbalanced across subjects. Although RPE values for the two groups did not differ for any of the workloads, the mean perceptual exponent for the high fit Ss (1.33 ± .43) was significantly higher ($p<.05$) than that for the low fit Ss (1.01 ± .42). Bivariate r's between RPE values and selected psychological variables were unimpressive for both groups. With the perceptual exponent as the dependent variable, combination of mean heart rate across workloads with selected psychological variables demonstrated that psychic vigor and tension were most important in explaining perceptual variance for the high fit group ($R = .66$, $p<.01$). Extraversion and tension were most influential for the low fit group ($R = .71$, $p<.01$). It was concluded that the RPE scale and magnitude estimation may assess different components of perceived exertion, and these components are differentially affected by fitness level. Further, a significant proportion of perceptual variance in a magnitude estimation task may be attributed to the influence of psychological variables.

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March 19, 1979
1:15 pm

## A COMPARISON OF MALE AND FEMALE ATHLETES AND NONATHLETES ON MEASURES OF SELF-ACTUALIZATION.

Julius Gundersheim, University of Massachusetts.

The purpose of this study was to make comparisons on self-actualization between and among college male and female athletes and nonathletes. Shostrom's Personal Orientation Inventory was utilized to measure self-actualization in the following male athletic teams; lacrosse (N=36), baseball (N=36), track and field (N=32), wrestlers (N=14), and gymnastics (N=5). The following female athletic teams were also tested; basketball (N=17), swimming (N=13), track (N=12), and gymnastics (N=9). The nonathletic males (N=43), and females (N=122) had no competitive athletic experience in either high school or college, and they were selected from a university core course which had an enrollment of 1000 students. A stepwise discriminant function analysis was utilized in comparing the groups. The results from the stepwise discriminant function analysis revealed that the 12 PIO scales did discriminate between the 11 separate groups which included four female athletic teams, five male athletic teams, a group of nonathletic females, and a group of nonathletic males. The exact location and nature of the discrimination required further hypothesis testing. When only the male teams were compared on the 12 POI scales, no discrimination was found. The same nonsignificant finding resulted when the four female teams were compared. The next comparison involved all the male athletes in one group and the nonathletes in a second group, which resulted in retention of the null hypothesis. The POI did not discriminate between a similar comparison of all female athletes versus female nonathletes. When all the women, both athletes and nonathletes, were compared to a similar combination of males, a significant discrimination occurred between the groups. The total group of females were more self-actualized than the total male group. This significant finding made it necessary to make two additional comparisons. The POI did discriminate significantly (p.05), between female athletes and male athletes, but no significant differences were found between the female non-athletes and male non-athletes. It was concluded that there were no differences in self-actualization between athletes and nonathletes, among the male athletic teams, and among the female athletic teams. The female athletes were more self-actualized than the male athletes.

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March 19, 1979
1:30 pm

### *RELATIONSHIP BETWEEN I-E LOCUS OF CONTROL AND INFLUENCE EFFECTS INDUCED BY EXPECTATIONS OF FEMALE GYMNASTICS JUDGES.**

**Charles J. Ansorge, John Scheer and James Howard, University of Nebraska-Lincoln.**

It has been determined that both male and female gymnastics judges are influenced by their expectations for the within-team position of gymnasts. Results of two studies reveal that gymnasts appearing late in the order for their team were scored significantly higher than the same gymnasts when they appeared early in the order. The purpose of this study was to determine the relationship between the degree to which judges were influenced by the within-team position of gymnasts and their I-E locus of control. The Team Optionals of the 1977 Region VI AIAW Gymnastics Meet were videotaped by the investigators. Two separate sets of videotapes, edited from the original tapes, were judged 48 hours apart by 10 nationally and regionally certified female gymnastics judges selected from three regions of the United States. The judges were told that they would judge the actual AIAW meet twice. However, the two videotapes were so altered that scores were collected for 40 gymnasts, each of whom appeared once in the first position for her team and once in the fifth position. Each of the ten judges was administered the Rotter Locus of Control Test at the conclusion of the first judging session. It was determined, after scoring the test, that five of the judges were externals (scores above the national mean for the inventory) and the other five were internals (scores below mean). To determine the relationship between locus of control and scoring of gymnasts, a 2 X 2 X 2 ANOVA (test-retest x first-fifth x internal-external) was utilized and F-ratios were tested for significance at the .05 level. Results revealed that judges who were classified as externals scored gymnasts appearing in the fifth position significantly higher than when they appeared in the first position, but no such difference was found for those judges who were classified as internals. I-E locus of control may be an important factor in the selection of future judges for gymnastics.

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March 19, 1979
1:45 pm

## COMMITMENT AND ADDICTION TO REGULAR RUNNING.

**Michael L. Sachs and David Pargman, Florida State University.**

Current running popularity has spurred millions of individuals to the roads, tracks and trails in search of the alleged benefits espoused by running's advocates. Recent attention has focused on the "addicting" properties of the running experience, prompting use of the terms "running addict" and "exercise addict." The relatively simplistic view of a linear relationship between intellectual commitment to running and psychobiological addiction to running was examined. A sample of 560 regular runners (running frequency greater than three days per week for the past 12 months for the majority of runners) was surveyed with a questionnaire. Measures of commitment and addiction to running, as well as demographic information, were obtained. It was hypothesized that runners could be categorized within a model employing a quadrant system, with commitment to running on one axis and addiction to running on the other. For example, evidence suggests that not all committed runners are addicted to participation, although this is implied in the popular literature. The sample of regular runners included 382 males and 178 females. The runners ran an average of 4.6 days per week for the past two months (an increase over the average of 3.8 days per week for the past 12 months), for an average of four miles per day. Addiction scores were normally distributed, although scores tended towards the more addicted end of the continuum (mean score = 47.3, possible range is 12-60, with 12 indicative of a low level of addiction and 60 indicative of a high level of addiction). Level of commitment was positively correlated with level of addiction. Results indicated support for the categorization of runners within the proposed model, and further suggest the need to consider different ways of clarifying motivation for participation in running.

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**March 19, 1979**
**2:00 pm**

## ANXIETY, ATTRIBUTION, AND SPORT COMPETITION: ASSESSMENT UNDER TWO FIELD CONDITIONS.

Jerry Freischlag, Canisius College.

One of the more interesting areas of sport psychology is the prediction of individual and team competition results. Factors which have shown promise include causal attributions and anxiety. Winning athletes are usually assumed to have lower anxiety and higher perceived ability than those who lose. This notion is complicated by the interaction of team attributes with those of the individual. Investigation of this causal attribution - anxiety - sport performance construct was necessarily pursued under two separate conditions: one to measure solely individual attributions and anxiety and a second to measure attributions of both team and individual. The first condition measured anxiety of candidates (N=30) for an "All-Star" basketball team; causal attributions were obtained from all subjects after team selection. The second condition was designed to assess pre-game anxiety and post-game attributions of players (N=32) in a series of basketball contests. Anxiety was assessed through Spielberger's STAI and Marten's SCAT while causal attributions (ability, effort, luck, task difficulty) were determined via a questionnaire. Multivariate and discriminant function analyses were performed on each set of data. The major purpose was to determine if causal attributions and anxiety were a function of winning and losing in each condition. Also, a combination of dependent variables was sought which discriminate between performances in each condition. Results indicated that subjects who were selected to the "All-Star" team had higher perceived ability and effort (Internal) and higher state anxiety during try-outs than did subjects cut as candidates. Subjects cut attributed their failure more to bad luck and had comparatively lower anxiety scores. Subjects tested under the second condition were more Internal in both self and team attributions following games won. Self attributions following a loss changed toward perceived bad luck and less effort expended; judgment of self ability did not vary from a winning outcome. Team attributions under this condition were the same as for self attributions. Anxiety did not vary with outcome of games. Results have implications for motivating athletic performance as well as prediction of success.

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March 19, 1979
2:15 pm

## DEVELOPMENT AND ASSESSMENT OF A SCALE TO MEASURE GENERALIZED EXPECTANCY OF SPORT SUCCESS.

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The purpose of this study was to investigate the reliability and construct validity of an instrument to assess the generalized expectation people have of their athletic success based upon their past sports experiences. This is an important motivational construct proposed by Rotter.[1] It was hypothesized that a direct relationship between sport participation and generalized expectancy of sport success would exist. The instrument was constructed using the semantic differential scaling technique. After editing and revision, 20 bipolar adjective items were used. A five point scale was used to allow subjects to indicate the direction and degree of their perceptions between the adjectives. The findings indicated that the Generalized Expectancy of Sport Success Scale demonstrated good internal consistency ($r = 0.955$) and test-retest reliability ($r = 0.902$). All items had a good dispersion of frequency of responses. Item-total correlations ranged from 0.544 to 0.838 with a mean correlation of 0.736 for 20 items. Therefore, all items were judged to be effective in contributing to the total score. The ANOVA of the total scale scores by sports participation (varsity, junior varsity, club sports, intramurals, informal and no participation) produced a significant F ratio of 13.809 ($p < .01$; 5 and 181 df). Orthoginal contrasts indicated that varsity, junior varsity and club sport participants as a group were significantly different from intramural, informal and nonparticipants. The upper level participants had higher group means than those who participated in lower levels of sport or not at all. The authors concluded that the Generalized Expectancy of Sport Success Scale was reliable and demonstrated statistical ability in discriminating between levels of sport participation, therefore, supporting its construct validity. In addition, it was concluded that as the level of organized sports participation increases the generalized expectancy of sport success also increases. This direct relationship supported the hypothesis of concern.

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1. J.B. Rotter, J.E. Chance, and E.J. Phares. *Applications of a Social Learning Theory of Personality* (New York: Holt, Rinehart and Winston, Inc. 1972).

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March 19, 1979
2:30 pm

**DIFFERENCES IN STRESS PARAMETERS BETWEEN HIGH & LOW MENSTRUAL DISTRESS SYMPTOM COMPLAINERS.** David C. Marini, Southern Illinois University at Carbondale.

One of the most pervasive but least studied stress-related problems concerns the cluster of symptoms known as menstrual distress symptoms (MDS). Recent literature has strongly supported a stress-related psychosomatic interaction with menstrual distress but has to date not sufficiently established the extent to which stress reactivity and personality actually contribute to menstrual distress. The purpose of this study was to examine the various relationships of stress arousal and stress-prone personality traits to menstrual distress. Fifty college students were blocked into two groups based on menstrual distress symptom prevalence: (1) high symptom complaint group (n=26); low symptom complaint group (n=24). Baseline levels of heart rate, respiration rate, muscle tension, skin temperature, and skin resistance were gathered on all subjects during the intermenstrual and critical menstrual cycle phases. A battery of stress-prone personality inventories was also administered, including trait anxiety, locus of control, type-A behavior pattern, and the neurotic triad of the MMPI. Comparisons by ANOVA with repeated measures indicated that there were significant differences in baseline levels of heart rate, respiration rate, and skin temperature in women reporting high menstrual distress symptom complaints. Utilizing ANOVA with repeated measures, it was also found that heart rate and respiration rate levels were high in the critical phase of the menstrual cycle, nonspecific to a complaint group. Further analysis by ANOVA with repeated measures found that high MDS complainers experienced significant decreases in skin resistance during the critical menstrual cycle phase. Comparisons by t-tests indicated significant differences in type-A behavior pattern, locus of control, and the neurotic triad of the MMPI between the symptom complaint groups, with high MDS complainers exhibiting more stress-prone traits than low complainers. The findings regarding stress arousal and stress-prone personality traits were compatable in their relationships to MDS. This study identified a relative profile of high menstrual distress symptom complainers, which included: more external locus of control; more type-A behavior pattern; higher scores on the neurotic triad of the MMPI. In light of these findings, it can be concluded that the stress-prone personality traits exhibited by high MDS complainers are consistent with the chronic elevation in psychophysiological stress arousal & may provide a basis for a more complete and comprehensive understanding of menstrual distress symptomology as a health problem.

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**March 19, 1979**
**3:00 pm**

## EFFECT OF HABITUAL EXERCISE ON TOTAL HEALTH AS REFLECTED BY NON-ACCIDENTAL INSURANCE CLAIMS. Donald L. Corrigan, A. H. Ismail and R. John Young, Purdue University.

This study investigated the effect of habitual exercise on total health as reflected by the number of non-accidental insurance claims submitted by Purdue University faculty and staff employees during a four year period. Forty-five male adult subjects were selected from a pool of over 200 participants in the 1971 Adult Fitness Program at Purdue University. Two discrete groups were established: 1) habitually active (n=29) consisting of subjects who had been regularly active since 1971, and 2) sedentary (n=15) consisting of subjects who were inactive before 1971; participated in the fitness program in 1971, then dropped the program and became sedentary again. The number and amount of non-accidental insurance claims between 1971-75 were obtained from the insurance records at Purdue University. In addition, physiological data including resting heart rate, systolic and diastolic blood pressures, lean body weight, sub-maximal heart rates and a physical fitness score were obtained for each subject for the years 1971 and 1975. Using appropriate univariate and multivariate statistical analyses, it was found that: 1) There was no significant difference between the two groups in terms of frequency of claims. 2) There was a significant difference between the two groups in amount of claims. The amount of claims associated with the sedentary group was twice as much as the habitually active group. The physiological variables measured also showed a significant difference between groups. It was concluded that the subjects who had exercised regularly over the four year period had experienced improvement in physiological conditions and enjoyed lower dollar amounts in terms of non-accidental insurance claims.

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March 19, 1979
3:15 pm

PERCEIVED DIMENSIONS OF HEALTH COUNSELOR EFFECTIVENESS. George S. Everly, Jr., University of Maryland, College Park.

Within the last several years, the fields of health education and counseling have been drawn together to fill a void in the health care delivery system; the result has been the emergence of the "new" field of Health Counseling. Health Counseling from a modern perspective must be considered as a combination of "education" and personal "counseling" as it entails health, hygiene, and related intra- and interpersonal concerns. While there is much agreement that health counselors are needed, there has been no research into what characteristics a health counselor must demonstrate to be effective. The purpose of this paper is to report the data collected to answer the question of what makes an effective health counselor. This study sampled the perceptions of 290 adult subjects (163 females and 127 males, average age 24.7 years) randomly selected from the University of Maryland, College Park. A previously validated instrument was used to measure components of behavioral effectiveness. A factor analytic methodology was used to identify the dimensions of perceived effectiveness. This research identified 6 meaningful factors of health counselor effectiveness: trustworthiness, energy, technical skill, communication skills, demeanor, and hygiene. These factors explained 69.6% of the total variation. In doing so, these dimensions have demonstrated their construct validity and may serve as guides to improve health counselor effectiveness. Additionally, these findings may be of use in health counselor training programs when they are identified. The 6 factors that have emerged via this research effort are congruent with previous communications and counseling literature, therefore, their operational definitions may be obtained from those sources. This issue will be expanded upon in detail in the full text of this paper.

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March 19, 1979
3:30 pm

**THE EFFECTS OF EXERCISE ON MUSCLE RELAXATION TRAINING. Linda Farrah Balog, University of South Carolina**

This investigation sought to determine the effect of vigorous exercise on EMG biofeedback trainability (EMG BFT) of chronic exercisers as measured by the frontalis muscle. Twenty chronic exercisers were randomly assigned to one of two groups: 1) a group which exercised for thirty minutes on a bicycle ergometer followed by biofeedback training, or 2) a group which trained without having had previous exercise. In addition to the eight 32-minute EMG BFT sessions, a ten-minute pre- and post-training baseline measurement without feedback was taken on each subject. While pre- and post-training baselines did not differ significantly between the two training groups, there was a significant decrease in muscle tension, pre- to post-test occasion, in both groups, indicating that learning did occur. A three-factor repeated measures design indicated: 1) no significant difference between groups in learning, and 2) some significance among days (groups combined) due to a significant change across days in muscle tension. No significant differences were found among the following interactions: groups x days, days x intrasession learning scores (bins), or days x bins x groups. Significance was found, however, among bins, and also among the bins x groups interaction. The trend of change in bin scores was quadratic and dependent upon which group the subjects were in. Further analysis by Tukey's HSD procedure indicated three significant comparisons among bins (groups combined) and among bins in the experimental group, while no significance was found in the control group. It was concluded that: 1) EMG biofeedback was effective in reducing resting muscle tension and seemed to be more effective than physical exercise in inducing muscle relaxation, 2) physical exercise did not enhance the learning of EMG BFT, but may in fact have hindered the learning process in the early minutes of training, and 3) twenty minutes of EMG BFT was sufficient for learning to occur within each training session.

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March 19, 1979
3:45 pm

# THE DEVELOPMENT AND EVALUATION OF RECREATION PROGRAMS AND THEIR EFFECT UPON THE MORALE AND FUNCTIONING OF ELDERLY NURSING HOME RESIDENTS.

Dorett Hope M., Boston University, 1978.

This study was conducted to measure the effects of recreation programs on the morale, physical and social functioning of 118 elderly residents from four nursing homes. Three recreation programs were conducted: movement, social, and the preexisting regular program. The movement program included gross motor activities such as games and exercises to music. The social program included activities with fine motor patterns such as table games, arts and crafts. Cheffers Adaptation To Flanders Interaction Analysis System was the scale used to validate the movement and social programs. The movement and social programs were conducted three times a week for 45 minutes per session over a six week period by the chief researcher and three senior recreations students. The residents were randomly assigned to the movement, social and regular activity groups. They were administered pre and post tests to measure their morale, physical and social functioning. The Philadelphia Geriatric Center Morale Scale (revised) was used to measure morale and the Geriatric Rating Scale of Plutchik et al was used to measure physical and social functioning. Analysis of covariance was used to determine the significance of effects. The data show that the movement program was significantly more effective than the social program in improving resident morale. The social program was significantly more effective than the preexisting regular recreation program in improving resident morale. No significant changes were found in resident functioning. The major conclusion of this study is that participation in recreation programs involving gross motor activities of movement and games is supported by subjective information obtained from diaries and evaluations by the activity leaders and from discussions with personnel at the nursing homes at which the data was taken.

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March 19, 1979
4:00 pm

## LEISURE ATTITUDES AND PRACTICES OF ELDERLY RECREATIONAL TOURISTS.

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The purpose of this study was to determine relationships, if any, between leisure activity participation of elderly recreational vehicle tourists and attitudes toward, motivations for, and barriers to recreating. Subjects (N=1089) were drawn from a popular winter RV tourist area in extreme South Texas. Respondents came from 38 states and Canada and all were over the age of 50. Data were gathered through an anonymous self-report survey instrument dealing with demographic variables, assessment of recreation activities, attitudes, motivations, and barriers to recreating. The instrument identified 31 activities and asked the respondent to rank order those activities in which he participated most frequently. Activity participation of the Ss was clustered into five typologies: games and sports; motorized-mechanical; nature appreciation; outdoor; and social.

Analysis indicated the most prevalent motivations for recreating were to provide: rest and relaxation; an opportunity to be with friends and family; physical exercise; a learning experience; and a feeling of self-fulfillment. The most prevalent barriers to recreating were lack of: facilities; companionship; finances; time; and physical ability. Chi-square analysis indicated significant relationships existed between participation in selected activity typologies and: 1) educational level and perceived health status and 2) the motives of rest and relaxation, physical exercise, and self-fulfillment. Significant relationships were also determined between selected motives and the variables of age, occupation, income, and health status. Conclusions drawn from the investigation were: 1) age and current health appear to be strong predicators of participation in active versus sedentary forms of leisure; 2) prior occupation and income exert little influence on current activity participation; and 3) earlier leisure motivations persist into retirement.

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**March 19, 1979**
**4:15 pm**

**THE USE OF INTERACTION ANALYSIS: ITS EFFECTS ON ATTITUDES AND TEACHING BEHAVIORS OF STUDENT TEACHERS.** Victor H. Mancini, Ithaca College; Enza Inturrisi, Ramsey High School; Patricia A. Frye, Ithaca College.

The purpose of this investigation was to determine the effects of feedback and interpretation of interaction analysis on the attitudes and teaching behaviors of student teachers in physical education. The subjects, 28 physical education student teachers enrolled at Ithaca College, Ithaca, New York, in the 1978 spring semester, were randomly assigned to either treatment or control groups. Teaching attitudes were assessed through the use of the Teaching Situation Reaction Test (TSRT), administered at the beginning and the end of the subject's student teaching experience. Teacher behavior was identified through the use of Cheffer's Adaptation of Flanders' Interaction Analysis System (CAFIAS). Three classes were videotaped during the semester for each subject. Treatment and control subjects viewed each of their first two taped lessons and received conventional supervisory feedback. Treatment subjects additionally had the results of the CAFIAS analysis interpreted for them. Data for final analysis of teacher behavior were collected from the third videotape of each subject. Significant differences between the treatment and control groups were determined through MANOVA on 8 CAFIAS variables and ANCOVA on TSRT scores for teaching attitudes. Univariate ANOVA's identified 6 of the 8 CAFIAS variables that contributed significantly to the group differences; each variable's contribution to the group differences was indicated by stepwise discriminant function analysis. The results led to the rejection of the hypothesis of no significant differences in teaching behaviors and teaching attitudes between physical education student teachers receiving feedback and interpretation in interaction analysis and those student teachers not receiving feedback and interpretation in interaction analysis. The following conclusions in favor of the student teachers who received feedback and interpretation in interaction analysis were supported: 1. They made greater use of both verbal and nonverbal questioning; 2. They used more verbal and nonverbal acceptance and praise of student ideas and actions; 3. Their classes exhibited more verbal and nonverbal pupil initiated behavior, teacher suggested; 4. Within this group both the student teachers and their students exhibited more interaction and varied behaviors during their classes; and 5. They had more positive attitudes on the Teacher Situation Reaction Test.

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March 20, 1979
9:30 am

**RELATIONSHIP BETWEEN ADMINISTRATORS' PERSONALITY AND HOW THEY AND THE FACULTY PERCEIVED THE ADMINISTRATOR'S ROLE AND DEGREE OF SUCCESS.** Dewayne J. Johnson, The Florida State University.

The purpose of this investigation was to study the relationship between selected personality traits of administrators and how they and their faculty perceived the administrator's role and degree of success. Subjects for this study were 41 department chairpersons and 282 faculty members of physical education departments at colleges and universities in the United States. Each chairperson and faculty member completed a 28-item role perception instrument that provided three sub-scores and a total role perception score, and a job satisfaction questionnaire that produced a total score. The chairpersons also completed the Thurstone Temperament Schedule that provided scores for seven personality traits. Correlation scores were calculated between all total scores and sub-scores for faculty and chairpersons. In order to determine if a significant difference existed between faculty and administrators on any score, t tests were calculated on each item score on the role perception and perceived success instruments. The Hotellings $T^2$ was used for the analysis of the vectors within sub-scores. Data analysis produced a number of correlation coefficients that were significant. Faculty's perception of administrator's success was related to the personality traits of stability and sociability as well as the administrator's perception of own success. Four of the seven personality traits studied were related to at least one of the administrator's scores on role perception and perceived success instruments. Significant differences were found between faculty and administrator's role perception scores for the areas of organiztion and for staff personnel matters.

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March 20, 1979
9:45 am

**FACTORS INFLUENCING CHANGES IN ASSOCIATE TEACHERS' PERCEPTION OF THE ADMINISTRATOR'S ROLE.** Beverly J. Yerg, The Florida State University; Dewayne J. Johnson, The Florida State University.

The purpose of this investigation was to look at selected environmental factors that may have an effect on changes in associate teachers' perception of the role of the school administrator. Subjects were 39 associate teachers (12 males, 27 females) at The Florida State University. Each subject completed a role perception questionnaire prior to and following ten weeks of associate teaching. Subjects also completed the California Psychological Inventory (CPI). Each supervising teacher also completed the 28-item role perception questionnaire. In order to determine if a significant change occurred in the associate teachers' perception of the administrator's role, dependent $\underline{t}$ tests were calculated on each item score using the pre- and post-intern role perception questionnaire scores. Hotellings $T^2$ was used for analysis of vectors within sub-scores. Pearson product-moment correlation was calculated for the associate teachers' pre-intern scores with their post-intern scores, supervising teachers' scores, and the associate teachers' CPI scores. The associate teachers' post-intern scores were also correlated with the supervising teachers' scores and the CPI scores. In order to attempt to explain the variation in the post-intern scores, multiple regression was run on the significant sub-scores to determine the best set of factors that would explain the variation. Analysis of the data indicated significant changes in the associate teachers' perception of the administrator's role in the areas of promoting interpersonal relationships; organizing, planning, and coordinating group work; and for the administrator's total role. Data analysis further indicated that the associate teachers' perception of the administrator's role was influenced by the organizational climate they perceived during the ten-week intern period.

Beverly J. Yerg
The Florida State University
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March 20, 1979
10:00 am

**A COMPETENCY-BASED APPROACH TO SECONDARY STUDENT TEACHING IN PHYSICAL EDUCATION. Paul W. Darst, Arizona State University and Doug Steeves, Brandon University.**

The purpose of this study was to investigate the effects of a competency-based approach to secondary student teaching in physical education. Secondary physical education student teachers (N=7) were observed along with one class of students from each teacher's assignment during baseline and intervention conditions. Seven categories of teacher behavior and two categories of student behavior were observed with an inter-observer reliability of 94%. Behaviors were observed by event and placheck recording procedures and were converted to rates per minute and percentages. These rates per minute and percentages were analyzed by behavior profiles and a multilpe baseline design. Teacher behaviors included: positive reactions to on-task behavior, negative reactions to off-task behavior, positive instructional feedback both general and specific, corrective instructional feedback both general and specific, and pupil contacts using the pupil's first name. The student behaviors included appropriate/inappropriate behavior and active/inactive behavior. Intervention consisted of a competency-based learning module, instructions, graphic feedback, cuing, reinforcement, weekly goals and terminal goals. The module contained specific definitions of the behaviors, examples of when to emit the behaviors, baseline means for the behaviors, and a final, terminal goal for each behavior. Results indicated that the intervention strategy had a large positive effect on the following teacher behaviors: general positive instructional feedback, specific positive instructional feedback, general corrective instructional feedback, specific corrective instructional feedback, and first name rates. A small positive change in behavior occurred in the positive reactions to on-task behavior and negative reactions to off-task behavior. The two categories of pupil behavior showed no changes. Based on these results, it appears that this intervention strategy was an effective technique for changing several categories of student teacher behavior. However, the impact on the student behavior was not significant. This study seems to verify the fact that there are effective strategies for modifying teacher behavior but the resulting effect upon pupil behavior is still unclear and inconclusive.

Paul W. Darst
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March 20, 1979
10:15 am

## ANALYZING ADVENTURE EDUCATION: BEHAVIOR PATTERNS, RELATING OBJECTIVES, SEQUENCING ACTIVITIES, AND DISCOVERING STUDENT PERSPECTIVE. David E. Wood, Boston University.

The purpose of this study was to describe the processes and procedures inherent in an Adventure Education experience. The technique of Participant Observation with interview was used to collect data through the framework of "symbolic interaction." Cheffers' Adaptation of Flanders' Interaction Analysis System (CAFIAS) was used for analysis of the spontaneous, instructor-student interactions and behaviors. During each session CAFIAS codings were done on all instructional periods and on the Adventure activities of the program. Raw data was systematically evaluated to build an explanatory model describing the point of view or "perspective" of the students. The results provided a description of the interaction patterns as students related to each other, to the staff, and to the environment; a comparison of these behavior patterns to selected program objectives; and a comparison between two activity sequences. The Adventure, problem-solving, activities involved more students in the role of teaching agent. There was a minimum of environmental influence. Instructors were less direct, allowing more pupil initiation that was analytical and student directed. The behaviors exhibited in all of the Adventure components, as well as the other activities investigated in this study, indicated instructor dependency (65% of the time) and instructor acceptance and encouragement. The instructor influence was noticed in all of the activities. The environment became an important teaching agent in the ropes courses and in all risk-taking activities. Student-leaders shared the role of instructor in the problem-solving activities in the program. Unpredictable behavior that was off-task was virtually non-existent (occurring less than 2%) in the Adventure activities. In activities in which emotional responses were evident by the students, there was a corresponding response of acceptance, empathy, or encouragement by the instructors. In all the program activities the behaviors observed were congruent to the activity objectives.

David E. Wood
Boston University
Boston, Massachusetts

March 20, 1979
10:30 am

### ITERATIVE-WINS PROCEDURES AS METHODS OF RANKING ROUND ROBIN TOURNAMENT CONTESTANTS.

Harry A. King, San Diego State University.

Round robin tournaments are often conducted to rank order persons with regard to their playing abilities in racquet sports. The derived matrix of results may be reduced to a player ranking in a number of ways. This study utilized computer simulation methods to investigate the relative effectiveness of four different ranking criteria: the number of wins gained; a points-for/points-against ratio; a Kendall-Wei iterative-wins score based on the once-iterated results matrix; and a Kindall-Wei iterative-wins score based on the four-times-iterated results matrix. A binomial statistical model was assumed to underlie the generation of match scores. Analysis of actual tournament result matrices indicated the tenability of this model. Fortran computer programs were written to simulate playing of individual games, and round robin tournaments among groups of different size and ability range. One hundred tournaments were simulated for each group considered and a player ranking derived from each set of tournament results using each of the four investigated criteria. Results demonstrated that iterated-wins methods were successful in diminishing the numbers of tied rankings, but were consistently less accurate than the number-of-wins method in estimating true player ranking. (This was true despite there being no tied true rankings—a fact which gave slight favor to iterated-wins methods.) Mean Spearman's Rho correlations between true rankings and empirical rankings ranged between 0.96 and 0.99 for rankings based on the number-of-wins score; similar correlations based on once-iterated wins scores were in the range 0.93 to 0.97, and on four-times-iterated wins scores were in the range 0.92 to 0.97. Iterative-wins procedures appeared to overcapitalize on low-probability results, thus diminishing their overall ranking accuracy. Ranking strategies based on these procedures apparently introduce unforeseen errors into ranking estimates, so contradicting their potential usefulness.

Harry A. King
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March 20, 1979
10:45 am

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